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[OFFICIAL NOTICE.]

American Gas Institute.—Bureau of Information.

AMERICAN GAS INSTITUTE,
OFFICE OF THE SECRETARY,
NEW ALBANY, IND., April 24, 1907.

To the Members of the Institute: The management of the Institute take great pleasure in announcing the formation of a Bureau of Information, composed of the following persons:

Name.	Subject.
W. H. Gartley, Chairman, U. G. I. Co., 22d and Filbert streets, Philadelphia.	Manufacture—Operation.
R. B. Brown, P. O. Box 824, Milwaukee, Wis.	Construction.
J. D. von Maur, care Laclede Gas Co., St. Louis	Distribution—Ordinary.
H. L. Rice, Western United Gas and Electric Co., Aurora, Ills.	Distribution—High Pressure.
F. W. Frueauff, 405 17th street, Denver.	Commercial.
E. H. Earnshaw, Fourth and Plum streets, Cincinnati	Residuals and Chemistry.

The members are invited to send *to the Secretary* all questions to which answers by the Bureau are desired. The Bureau will not attempt to do the work of a consulting gas engineer. It will in many cases rather attempt to indicate methods of solution, than actually solve the problem given. Where satisfactory answers already exist to questions asked, the questioner will be directed to these answers. Where the questions are incapable of a positive answer, the questioner will be so told. Where the matter is plainly one for a consulting gas engineer, the questioner will be advised to employ one.

All questions and answers that may be deemed of value to the membership in general, will be recommended by the Bureau to the Directors of the Institute for publication in the "Proceedings."

WALTON CLARK, President. JAMES W. DUNBAR, Secretary.

Rules to be Observed in Sending Questions to the Secretary for Answer by the Bureau of Information.—Wherever possible, all questions should be typewritten. Each question should be on a separate sheet of paper, size approximately 8½ inches by 11 inches. Each sheet should contain the name and address of the member asking the question.

[OFFICIAL NOTICE.]

Annual Meeting, Wisconsin Gas Association.

WISCONSIN GAS ASSOCIATION,
OFFICE OF THE SECRETARY,
RACINE, WIS., April 25, 1907.

To the Members of the Wisconsin Gas Association: The next annual convention of this Association will be held in Milwaukee, Wis., with headquarters at the Hotel Pfister, Wednesday, the 15th, and Thursday, the 16th, days of May next. Respectfully yours,

HENRY H. HYDE, Secretary.

BRIEFLY TOLD.

THE RIGHT SORT OF A REPORT.—Some weeks ago we reported the fact that the Honorable Wm. B. Thompson, the Mayor of Detroit, Mich., had appointed Messrs. James T. Lynn and A. B. Beadle as qualified experts to examine into and report upon the existing conditions as to the gas supply in and of the city of Detroit. These gentlemen, having made an exhaustive examination of the conditions of the gas supply of the city, submitted their findings to the city in due time, and we submit that their presentation thereof far more than justifies the prediction that the Mayor had acted wisely and well in submitting the matters involved to the inspection of the gentlemen named. The report, which was handed over early in April, was of sufficient importance and value, despite its lengthiness, and of necessity its technicalness, to cause at least three of the daily newspapers to print it in full. An excellent reproduction of the report was printed in the Detroit *Times*, of April 24th. The investigators divided their work into 13 separate sections, each of which related to some salient point in their work, and all compose a record that many who will engage in similar work hereafter may find it advantageous to employ. To show the thoroughness of the investigation we here reproduce the classification of the report headings. These were: Gas supplied; gas main system; pressure tests; pressure conditions; distribution conditions; proper pressure of gas; quality of gas; sulphur; ammonia; sulphuretted hydrogen; inspection of gas; gas analysis and proposed new ordinance. The story under each of these heads is succinctly told, and in such way that neither symbols nor equations were used. Not that either or both of the gentlemen could not use those implenty; but as the findings were meant for men in the practical rather than the professional class, practical terms were written in the recommendations. The whole affair bespeaks the wisdom of the authorities in putting such matters in the hands and thoughts of men qualified by a life's experience to consider them knowingly, dispassionately and thoroughly. In this instance New York might well pattern after Detroit. Perhaps it will, later on. It certainly has not so done heretofore.

LIBRARY OF CONGRESS. MAY 6 1907. SMITHSONIAN DEPOSIT.

CURRENT COMMENT.—

THE M. H. Tredwell Company has removed its New York offices from 95 Liberty street to the West Building, 140 Cedar street.

HEREAFTER the main offices of the C. H. Geist Company will be in suite 600, Commercial National Bank Building, 115 Adams street, Chicago, and all Companies controlled by it will be operated from that office. Its Philadelphia offices will be maintained at No. 928 Land Title Building, as headquarters for its Eastern bond department. Mr. Lucien H. Tyng will be in charge there.

THE Directory of Membership, American Gas Institute, gotten out under the direction of Mr. Thomas C. Jones, the Institute's clever Treasurer, is a beauty, and its classification arrangement is certainly excellent.

MR. CLYDE E. CHEESEMAN has been appointed to a position on the corps of the State gas inspection staff. His home is in Syracuse, N. Y., and he was selected from the last eligible list prepared.

HERE is a story from real life which was reported in the Jenkintown (Pa) *Record* of April 26th: "Reverend Samuel Jones, Pastor of Salem Baptist Church, is under $100 bail for a further hearing before Magistrate W. Comly Walker, next Thursday evening, on the charge of diverting the gas pipes in his home and place of business, with the result that the illuminant was supplied directly to the lights without first passing through the meter and, of course, without remuneration to the Gas Company. Mr. Jones is at the head of a colored congregation, and the charges have caused considerable of a sensation in the suburban section. The minister declares that a former employee is responsible. Prosecution of the case was made through Mr. L. R. Dutton, of the Cheltenham and Jenkintown Gas Company. Adam Clarke, an inspector, went to the Jones home on Wednesday and found the pipes connecting with the meter incased with boards and no money in the meter. A further investigation by Foreman Neiderer exposed the tampering with the pipes. Jones is President of the National Institute, a brush making industry here, and it is declared the same condition was found prevailing at the factory. He said at the hearing that an employee named Jeffries had often done work for him at his home, and declared that he had supplied Jeffries with money to put in the meters. Some time ago the gas pipes had frozen and Jones believes that Jeffries then made the changes. He denied knowing the connections had been changed. The gas officials, rather than condemn the minister without absolute proof, asked a continuance of the hearing and advised Mr. Jones to make every effort to locate Jeffries before next Thursday and thus exculpate himself, but Jeffries, according to Mr. Jones, has skipped."

A CHARTER has been issued to Messrs. Bernard Way, A. Liseman, J. H. Gunder, Edwin Irwin and R. W. Shoop to construct and operate a gas works in Freeport, Pa. The Company is to be known as the Cumberland Gas Company, of Freeport, and it is capitalized in $48,000.

THE London *Globe* says: "That a German patent covers the employment of egg shells as gas mantles. The two ends of the shell having been removed, it is to be supported by a gas burner, so that it may be heated to incandescence from the inside. Eggs are getting scarcer; and this may throw a little light on the subject." Yes, we know; that is so.

AS we noted before, the Gas Machinery Company, of Cleveland, O., has been awarded the contract for the construction of a hydrogen generating plant at Fort Omaha, Neb. This plant will be the preliminary practical step toward the creation of an experimental station for testing army balloons. This hydrogen plant will be one of the largest in the world, and up to the producing of 5,000 cubic feet of gas per hour.

THE way in which the Welsbach Street Lighting Company, of America, beat its striking lamplighters in the Brooklyn district of New York was to let the lamps burn day and night. A friend of ours in reporting the defeat of the strikers remarked, "The trimmers are trimmed." So they were.

MESSRS. MCKENZIE and Mann have been granted a franchise for the operation of a gas works in Port Arthur, Ont.

MR. W. M. SEYMOUR, of Tacoma, Wash., and associates, have purchased the Gray's Harbor (Aberdeen) plant.

A CORRESPONDENT in Manitowoc, Wis., writing under date of April 29th, incloses the following: "Complying with a section of its franchise which requires that the city be given the first chance to purchase the plant in event of sale, the Manitowoc Gas Light Company has filed papers giving the city an option at $160,000, a price which has been made to and will be accepted by private interests. The city has 30 days to accept or reject. The franchise is for 25 years and provides for appraisal after expiration if purchase by the city is desired. Henry Vits is President of the Company, which was organized in 1900, and put its plant in operation in July, 1901. It is not probable that the city will accept."

[Furnished by the Secretary.—Concluded from page 716.]

PROCEEDINGS, THIRD ANNUAL MEETING, ILLINOIS GAS ASSOCIATION.

HELD IN NATIONAL HOTEL, PEORIA, ILLS., MARCH 20 AND 21, 1907.

SECOND DAY—MORNING SESSION.

The session was called to order by the Vice-President, Mr. Z. T. F. Runner, at 10 A.M., March 21, who announced that before the regular order was proceeded with the members would listen to a

STATEMENT FROM THE SECRETARY.

The Secretary—Regarding the arrangements made to take you all this afternoon to visit Clarke Brothers' distillery, Mr. Nelson, General Manager of the Peoria Railway Company, has arranged to have a car of the Peoria & Pekin Terminal Company at the hotel, at 2 P.M., to convey those who desire to make this trip. I assure you it will be profitable and interesting, especially to those who have never visited a large factory of this sort. A word to the appliance men present with us. A large part of the credit for the success of this meeting belongs to the appliance men for their preliminary boosting. I have appreciated the courtesy shown me all along and the assistance they have been to me, and the Association is very glad to have had them here as guests. Mr. Rice has given notice that at our next meeting he will introduce an amendment to our by-laws admitting appliance men as members of our Association. If we have been able to show the appliance men any courtesy, and they see fit to boost along the work, helping to make this Association a success, we will appreciate their work very much. In connection with the boosting proposition, I want to call attention to the Co-Operative Electrical Development Association designed to boost the electrical business. Among other things it endeavors to induce every man interested in the electrical business when he strikes a town and makes a purchase of any kind, a railroad ticket, a collar button or any other article, to boost the electrical business. There is no reason why we should not do the same thing by co-operation with the appliance men. A little boosting goes a long ways. If, when an appliance man goes to a town and stops at a hotel, he tells the proprietor he is not up to date if he does not cook with gas; that he ought to appreciate home industry instead of giving his money to the Standard Oil Company, he boosts his own business. There are thousands of little ways in which boosting may be done. The bread and butter of the appliance and the gas men come from the same source. No man boosts another man without getting more in return than he helps the other fellow. We have just started this organization at this meeting, and if any of you run across a man out the State who is in the business, but did not attend this meeting, I would like to have you emphasize what a good time he missed and make him feel he must attend the next meeting. Nearly 100 men are present at this meeting and we want to have 250 present at our next. We want to make this Association not only an Association but a boosting Association. I thank the appliance men for the boosting they have done for us and assure them that the Association appreciates their help. Mr. C. H. Quackenbush, General Manager of the East St. Louis Gas Light Company, was elected Secretary of this Association at a meeting of the Executive Committee held yesterday afternoon to fill the vacancy caused by my resignation. You will find him an energetic worker who will keep things moving along. He will be a credit in every way to the Association.

A FRATERNAL COMMUNICATION.

The Chair—I believe Mr. Rice has a communication to present this morning.

Mr. Rice—Mr. Chairman, I feel greatly honored to be called upon to pay a slight tribute to our retiring Secretary-Treasurer, and I am sure it will be indorsed by the members of the Association. Our tribute is:

In the great success of this, our first ambitious attempt at a large and carefully organized gas association meeting, we may indeed congratulate ourselves, but it is with great regret and sorrow that we find ourselves forced to face a most unwelcome event coming upon us at this time. Towards our success and the great value that the work of this Association has already become to all our members, no one has contributed more than our efficient and hard working Secretary, Mr. J. M. Robb. He has spared no effort but has given freely at all times and seasons of his energy and talent in the exacting work of the Secretaryship of our Association. His ability as a gas man, so long clearly marked by his associates, has found recognition in the broad field of our business work, and he has been called to an important post which will remove him from our midst, and which, under our rules, takes him

from our membership roll. Our great regret at losing him as a member from our Association, and especially as our Secretary, is tempered by our great satisfaction in the promotion that has come to him, and which we feel he has so fully merited.

Our best wishes go with him in his new field of work, and we trust he will always remember that the hand of good fellowship is outstretched to him from every gas man in Illinois, ever ready to welcome him back as a visitor and perhaps some day again to the fold of membership.

We wish you, Mr. Robb, Godspeed, good fortune and may you come back some day, for good, to Illinois. [Loud and continuous applause.]

Mr. Strohn—I move the resolution be spread upon the records of the Association and a copy be furnished Mr. Robb. [Seconded and adopted unanimously by rising vote.]

Mr. Robb—Gentlemen, I know you are sure I appreciate your kindness in this matter. It is impossible for me to express to you how I feel about it.

A Resolution of Thanks.

Mr. Olds offered the following resolution:

This, the third annual meeting of the Illinois Gas Association, has been one that will always be remembered for the delightful entertainment and hospitality given the members by the Peoria Gas and Electric Company. Therefore, be it

Resolved, That the thanks of this Association be given the Peoria Gas and Electric Company for its efforts in making our meeting a success. [Adopted,]

Next Place of Meeting.

The Chair—The Executive Committee has decided on Chicago as the next place of meeting. The paper to be considered this morning is that by Mr. William I. Battin.

Mr. Battin then read the following paper on

THE BEST METHODS OF OPERATING WATER GAS MACHINES.

In submitting the subject for this paper your Secretary suggested that it should be gotten up in such a way that the men who actually run carburetted water gas machines could find in it directions as to how a machine should be run and why it should be so run. The paper, therefore, can contain nothing new to the members of this Association. All theoretical discussion and technical terms must be avoided and all reference to the special methods in use in very large gas works. Perhaps this is just as well, because while burettes and calorimeters are very useful in determining the design of machines, yet it is not necessary to use them in order to operate a properly constructed gas machine at the highest possible efficiency.

Where a man is first taking hold of a gas machine he should take the machine before it is fired up and go through the operations of making the various changes of valves until sure he knows just how it is done. Let him take the same amount of time to do this that would be required if the machine were running, and go over it again and again, and as he makes each change let him be sure he understands just what the result will be and why it will be so. Likewise, let him open up and examine all valves to see that they are in first-class condition and operate freely, and let him go through the operation of cleaning the take-off pipe and seal pot. Even though he understands the operation of a machine a gas maker cannot operate it to the best advantage unless he knows something about the design of the apparatus, so the first part of this paper will take up this matter of design and materials used.

Water gas apparatus to be right should have about the following proportions:

The generator should permit a fire when coke is used of from 7 to 9 feet in depth (see Bibliography, 31). There should be enough checkerbrick so that when No. 1 square brick are used, spaced 2½ inches apart, there will be about 200 such brick for each square foot of grate surface. There should be a blast pressure stiff enough to maintain 16 to 18 inches under the grate when the fire is being blasted, even though the fuel be very easy to blast through. The stack valve opening should be large enough to cause not over 3 inches pressure on the space under the opening to the stack valve, when the machine is blasting freely, and the openings between the different parts of the machine should be as large as the stack valve. The speed of the blast through the fuel should be such that the difference in pressure with a clean fire between the bottom of the fire and the top of the fire, at the middle of any blasting period (when the secondary blasts are on) should be about as follows:

For oven coke, 3 inches; for gas house coke 4 inches; for large, clean anthracite 6 inches; for anthracite which contains a great deal of small stuff it can be run from 8 to as high as 12 inches.

The oil should be evenly sprayed over a large surface of the checkerbrick and the oil should have at least 3 feet of space between the spray and the checkerbrick to spread out and thoroughly intermingle with the blue gas. In some machines the oil is sprayed upward underneath the checkerbrick. In this case a few checkerbrick carried on arches must also be provided under the oil spray so that if the blue gas fails to carry all of the oil along it will not fall into the fire or collect in a pool at the bottom of the oil chamber. A good oil measuring device must be used to determine exactly the amount of oil put in each run. The steam can be of any pressure, but it must be pretty dry and the steam pipes large enough to admit a great excess of steam when necessary. The steam also should be measured in a way; that is, a cock should be placed between the throttle valve and the machine, and a gauge placed on the line between the throttle valve and this cock. Now the cock should be so set that by carrying on this gauge a pressure say ⅓ of the lowest that the boiler pressure will ever get, the proper amount of steam will be admitted to the machine. For example, assume that the boiler pressure will get down to 60 pounds, then set the cock so that 40 pounds on the gauge will admit the proper amount of steam. It is evident now that a uniform amount of steam can be admitted each run, no matter how much the main steam pressure varies. (See Bibliography, 42.)

Enough steam should be admitted to make the maximum possible amount of blue gas. There is a point where even a large increase in steam does not materially increase the make. Any excess means pure loss and decreased efficiency and makes that much more waste water to be taken care of. If the gauge is set so that 40 pounds is right for the first part of an up run, then 50 pounds should be used on a down-run, and the last half of both runs should be made with 10 pounds less pressure than the first half. (See Bibliography, 43).

It is sometimes desired to see what kind of blue gas a machine is making. Just tap a hole between the generator and the carburetter, where you will catch either the up-run or down-run gas. Put on an ordinary ¼-inch pet cock and provide a pilot light to keep the blue gas burning, should it go out. If the gas is allowed to come out at such a rate that the flame of blue gas will be only about 4 inches long at the start of the run, the gas ought to burn throughout the run. If it goes out it shows excess of steam or other bad conditions. This "hydrogen light" should not be necessary if short runs are made, but if long runs are tried it will show up nicely how the blue gas deteriorates after the first few minutes of a run.

The gas take-off pipe between the machine and the seal pot must be large enough so that even when 2 or 3 inches of lampblack have accumulated on the inside surface of the pipe all around, there will still be no excessive back pressure on the machine while running. And, of course, the same idea applies to the pipe and other apparatus into which the gas goes from the seal pot. The back pressure on the machine should not exceed 20 inches, the lower the better. The siphon gauges used must be of such length that they will never blow out while on the run, otherwise the gas maker will keep them shut off all the while. The pipes to these gauges should be tapped into the space itself on which the pressure is to be taken, as for example, under the grate bars, and not be connected onto a blast pipe or other connections to the machines. The gauge pipes should be not less than 1 inch in size and provision should be made for traps, etc., and just below the shut-off cock on the gauge live steam should be connected into each pipe to blow back through it and free it from tar and dirt.

One sight cock should be provided where the oil enters, another 3 or 4 feet along in the checkerbrick and another 3 or 4 feet before the gas leaves the checkerbrick to go out of the machine. These sight cocks must be so arranged that a man can get at them without any inconvenience whatever. An up-and-down make on the fire is desirable on even the smallest machines, and the up-and-down run valve must be a tight valve.

Now, touching on safety. All openings on the machine should be provided with bolts enough so that the breaking of one will not allow the doors to fly open. Safety plugs of the full size of the blast pipe should be lightly driven into the ends of it. These will blow out in case of explosion and stay out until they are put back again in place. Don't use flaps which fall back again into place, or the contraction instantly following the explosion will probably collapse the pipe. An opening should be left in the blast pipe just outside the carburetter valve, and the air coming out from this point should be piped to where the gas maker can see it so that if gas is getting into the blast pipe through leaky valves it will show up right away. There

should be an extra valve in the pipe through which the gas from a down run passes, which can be shut to prevent air from getting under the grate when repairs are being made, for example, at the up-and-down run valves. It is sometimes customary to slow down the blast engine while no machines are being blasted. There is really no economy in this and the danger of a blast pipe explosion is much greater.

Another practice which should be discouraged is that of raising the blast valve when coming off a run before the stack valve is opened. Certainly no harm can come from driving the gases formed while blasting over into the holder, but if by any chance the back pressure on the gas main is higher than the blast pressure, and the machine happens to lose her seal before coming off the blast, the gases may be driven back into the blast pipe.

Almost any oil caa be used, provided the heats are kept right. On the other hand, there is no point in the handling of a gas machine of more importance than good fuel. It is not necessary to give here a description of good fuels. (See Bibliography, 24). The only way to tell a good fuel is to try it out in the machine, but the following points should be noted:

The fuel, whether coke or anthracite, should be dry. Any great, big chunks should be broken, and yet generally speaking it should be not smaller than 4-inch cubes nor should it go to pieces in the fire and get soggy. The fuel should be of uniform quality from day to day. Poor fuel is bad enough, but changing from day to day is worse. Where a poor fuel or a small fuel must be used, it should be mixed in with better fuel.

The firebrick, either for lining or checkering, need not be of high grade—almost any firebrick will do provided they are of very uniform size and not too easily broken.

The gas from a water gas set should be cooled in condensers. Don't run the water from these condensers into the tar wells, because it is perfectly clean and can be run off by itself. The gas need not be put through a scrubber. However, if a scrubber is used, hot water should be used on it, and likewise the water in the seal pot should be hot water. By hot water we mean water pumped around and around from the tar settling wells. It is evident then that as long as there are no leaks in the condenser, no water will be added to these wells except the condensation from excess steam used in the machine, and evaporation will pretty nearly take care of this, hence there will be practically no waste water to pollute streams, and by watching the amount of water thus being made every day, it will be possible to adjust the stream on the machines for the change in fuel very nicely.

Doing away with the large amount of waste water is in line with the idea that a water gas works can be run without causing annoyance to anyone living near it. For the same reason, the minute a machine is fired up, and as long as it is under fire, a pilot light should be kept burning pointed at the stack valve opening to ignite the gases the instant the cap is raised. Then there will be no bang at the stack such as will be heard when the blast gases go off for a while without burning, and then light themselves as soon as the superheater gets hot enough, and all the oil vapors will burn up clean so there will be no greasy smoke to issue from the stack.

When it comes to making changes in operation on a gas machine, this must be remembered: It will take 1 or 2 days before you can be sure that you are really getting the results of a change—it takes that long for all the apparatus to respond to a change and get settled again. It is perhaps superfluous to say that only one change can be tried at a time. Everything should be done that will add to the handiness of the appliances used around the machine so as to leave the gas maker free to watch his apparatus. Insist upon cleanliness. After each coaling or cleaning the dirt should be swept up; and the apparatus should be kept painted and the building walls whitewashed or otherwise kept bright and clean. Don't have any oil leaks or steam leaks, and keep all gauges and gauge glasses shined up.

Before starting a fire in the generator it must be certain that water is overflowing from the seal pot into the little overflow pot which must also be kept full to overflowing; and this stream of water must be flowing as long as the machine is under fire, but it should be checked down just as close as possible, because the appearance of the surface of the still water in this overflow pot is one of the best indications of the working of a gas machine. When once the heats are right in the machine the surface of the overflow pot should contain no scum at all, but if the machine gets dirty or too cold a foamy tar will immediately show on the surface of the water. The surface of the water in the tar well should be also free from foam or light tar or oil. The hot water circulating should be a dark color, of course, but clear and not foamy. As soon as foamy tar shows on the tar separator, either the heats are too low or the machine is getting in bad shape. The tar itself should settle out quickly and sink to the bottom and be a good, heavy, black tar that with a little heating can be freed from practically all the water it contains. A thin brownish tar is a sign of bad working somewhere.

Enough slabs of wood are put on the grate of the generator to make a pile all over the grate a foot or so thick, and on this a couple of feet of coke is shoveled. Big slabs from coke cars can be used without breaking them up. Then oily waste is stuffed in around the wood. All the blast valves and other valves are kept shut and also the gas valve at the outlet from the seal pot. The stack valve is, of course, left open. Now the pilot light at the stack is lighted, the coaling door being left open an inch or so, the oily waste is touched off. The coaling door should not be closed tight, because after a draught is once started through a machine the volume of air being drawn in will burn any combustible gases that may collect above the fire and prevent an internal explosion, or so-called "shot," on the machine; moreover, it will mean that a large volume of warm gases is passing through the machine rather than a small volume of hot gases. Any moisture will be dried out of the set better and the brickwork will not be too quickly heated up. There is no harm done by "shots" in a gas machine unless one happens to be standing in front of an open door, where he might be burnt, but the terrific report is not calculated to reassure either the gas maker or those who live in the neighborhood. A little coke can be added every few hours as fast as the fire heats up, and the bottom doors all this time can be kept just cracked by closing them against a piece of tin. If it is desired to heat the fires up quicker, open the doors a little more. The fire should be not more than a couple of feet in thickness while draughting up the set. All this time it is well to have a hole through the fuel so that if you open a bottom door you can look up through this hole over the top of the fire. The air going up through the hole will burn the combustible gases and prevent a pop. There is very little danger of overheating the grate bars, but if, on opening the bottom doors, they appear to be melting hot, a little steam admitted under the grate will prevent injury to them. Never open the bottom doors on a gas machine without turning a little steam under the grate.

The longer a set is dried out the better, but where the machine has been only re-checkered the blasting can be started immediately if necessary. Up to this point there should be no danger of "shots" in the machine, but you will certainly have them if the coaling door is shut and there is not enough air getting up through the hole in the fire, or if the fuel has been added too much at a time. The gases formed in the fire will mix with air getting down through the stack valve, or again, the minute the coaling door is opened there will be a shot. If the coaling door has been shut, lay a piece of lighted waste on the door to ignite the gases as soon as the door is open; and always stand to one side of any door of a gas machine while opening it. When the machine is once thoroughly heated throughout it is not necessary to use the lighted waste, but in all cases the coaling door should be just cracked until the flame inside the crack shows that the gases are lighted; then it can be opened up full.

Before putting the machine on blast the generator should be filled with coke right up to the top, then close the bottom doors and the coaling door, wiping off all dirt from the joints of the doors. The generator blast can now be cautiously put on full—after 10 or 15 minutes a little stream can be turned under the grate with the blast. This will protect the grate bars and get the heats up more rapidly in the checkerbrick; the first blow can be about 20 minutes. Then the blast valve can be shut and a steam run made—which means that the gas valve at the outlet of the machine is opened and the stack valve closed. Then the regular amount of steam is put under the grate and the resultant blue gas is sent over into the holder. As the blue gas knocks the candle power badly, some operators allow this gas to burn at the stack. This, however, will get the stack red-hot. The run will last 6 minutes, and then the steam can be shut off and the machine blasted up again for 10 minutes or so. When 2 or 3 alternate blows and runs have been made there will be heat enough in the carburetter checkerbrick, so that on the next blast, if the carburetter secondary blast is slowly raised a little, the gases from the generator will ignite, and then the carburetter blast valve can be raised high enough to burn all the gases in the carburetter. This will pull the flame at the stack right down into the machine. The bricks will heat up rapidly. The secondary blast must not be kept on, however, unless it is certain that the gases are burning in the checkerbrick, which will cause a blue flame to be seen by looking through the sight-cock into the oil chamber. After two more such steam runs the carburetter will be showing quite a little heat and then the carburetter secondary valve can be raised less and the superheater

secondary can be cautiously raised so as to burn the gases in the superheater and thus heat it up. Be sure the gases light in the checkerbrick; if they don't, the cool air will cool off the bricks rather than heat them up.

All this while the machine will have turned out no good gas, but as soon as the heats show a bright red in the carburetter and the superheater shows some heat, the regular blasting and running can be started. The outlet valve from the machine is opened and an 8-minute blast made on the machine, then the regular amount of steam can be turned on the bottom of the fire and the blast can be closed, superheater first, carburetter next and generator last. If it is handier on any particular machine to close the blast valve before the steam valve is opened, it is all right to do it that way, or if there is a very loud roar when the stack valve is closed, the steam can be left shut off until the cap is down and then turned on. The advantage of putting the steam on a little earlier is to purge the blast gases out through the stack instead of sending them over into the holder. The stack valve must be cautiously closed, the pressure gauges being watched to see that no excessive back pressure shows on the machine. When the stack valve is closed the machine is on the run, and the blue gas is going out through the seal pot into the holder. The oil is now turned on at such a rate that in 5 minutes the amount for one run will have been put into the machine. As the make of gas per run increases after cleaning, some operators use 10 per cent. more oil for the first 4 or 5 hours after cleaning than they do for the rest of the time up to the next cleaning. When the oil is turned on the pressure gauges must be watched. The oil should be put in fast the first 2 or 3 minutes and be all in in 5 minutes so that a full minute of steam run can be made to purge out any oil lying in the machine. At the end of the sixth minute the steam is turned off and the stack valve raised. Whenever a gas machine has been lying idle for some time, always turn on a little bottom steam before raising the generator blast valve. The blast valves are then cautiously raised, generator first, then after a minute or so the carburetter next, and the superheater last, and the blasting is continued at 8 minutes and the run at 6 minutes. Soon the carburetter will show a bright red heat and the superheater, if anything, a little hotter. When this condition has been reached, as long as the machine is kept running, the superheater blast valve will probably never need to be opened again, as the superheater will keep hot enough, but the carburetter blast valve must be opened each blasting period; just a little at first, to be sure that it lights, and gradually increasing the opening toward the end of the blast so as to just burn all gases in the machine, leaving only the occasional flicker of blue flame at the stack. Soon the heats in the machine will be such that a 5-minute blast, using the secondary air in the carburetter only, will be long enough. With anthracite coal the blast will have to be a couple of minutes longer.

At the end of each hour the generator must be filled with fuel; this is done immediately after a run, the generator blast being put on, however, for a few seconds, to drive the run gases out of the machine. Then the blast valve is closed and the coaling door is opened. Unless the machine is thoroughly heated up, don't forget the lighted waste to ignite the gases the moment the door is cracked.

The first steam runs on a machine should be all up-runs; after them there should be one down-run made for every three or four up-runs, if the fuel is good, and more down-runs if the fuel is bad. When the machine is on a down-run it must be changed over to an up-run before the run is taken off and blasting started again. With 6 minutes run and 5 minutes blast, there will be about 5 runs made each hour (allowing 5 minutes for coaling, etc.). With the best fuel, then, one down-run each coaling is sufficient. With fuel that tends to overheat at the top of the fire or clinker at the sides of the machines, an extra down-run each coaling can be used. With very bad fuel the runs should be alternately up and down, or better still, let the first part of each run be made down on the generator and then change over and make the last part an up run.

After the machine has been running 12 hours the gas valve should be closed and the fire cleaned. This is done by blowing the machine out the same as before coaling up and then instead of opening the coaling door a little steam is put on the bottom and the bottom doors are opened. The stack valve should then be closed. If there is no steam leaking in above the fire the amount of blue flame which will come out of the cleaning doors will be negligible. If the stack valve is not closed the draught will make the fire melting hot and throw the heats in the checkerbrick out of balance.

It is not necessary to scratch the little clinkers off the grate from under the big clinker, nor to cut the clinker off from the walls, and the clinkers should not be cut up into small pieces by a punching movement with the light bars. Instead, a very heavy bar of large diameter, 3 feet from the chisel end and tapered toward the point and toward the handle end, should be pushed way under the center of the clinker between two grate bars. Then the handle end is raised up high and jerked down quickly. The shock will break the heaviest clinker. By repeating this movement the whole clinker will be broken up into large chunks which can be pulled out of the fire. The middle clinkers should be pulled out first, those in front of the door holding up the fire in the meantime. The whole idea is to get the clinker out and keep the fire in. Dumping grates will make this very much easier to accomplish. Of course, all fuel which falls out is freed from clinker and used again, but no matter how carefully this is done the generator fuel used per 1,000 feet of gas made will run up very fast if much fuel is pulled out during the cleaning. That is one of the serious objections to bad fuel.

The ashes are then cleaned out from under the grate, the stack valve opened, and the bottom doors wiped off and shut. The machine is then ready to be coaled up for another run unless there are clinkers sticking to the side walls of the generator. When there are, the coaling door must be opened and the clinkers knocked off. It will be necessary in such a case to pull out practically all the fire downstairs in order to get at these side clinkers. It is useless to try to bar them off the sides of the generator through a deep fuel bed, or to keep them off by barring down through the fire at each coaling. Anyway this is quite impossible with any machines except those which have a separate generator with a coaling door through its top.

Sometimes machines are "burned down" low before pulling them out—in other words, many runs are taken off the machine without coaling up, so as to consume the fuel as nearly as possible. This means a fire getting very dirty and a machine heating up badly. Nothing is probably saved by doing it and it involves a loss of time. Where bad fuels are used, it is sometimes better to run a fire that is not very deep so as reduce this loss of fuel and because of the lessened resistance to the passage of the blast gases. (See Bibliography, 32). But even then poor fuel will give you that bad condition of excessive heat in the top of the generator and in the checkerbrick. There is no other cure for this like coaling up often—in fact a little fuel put in once an hour is the ideal way to charge machine as against large amounts every 2 or 3 hours. Excessive heat at the top of the fire will not only spoil the efficiency of the machine but it will probably get the various fittings and connections and the up-and-down run valve so hot as to burn and destroy them rapidly. Perhaps it may even cause them to break and put the machine out of commission. An outsider, looking through the coaling door into a generator fire which is dazzling hot, naturally thinks it an ideal fire for gas making. The experienced gas maker knows he would rather have a fire at this point hardly more than deep red.

Of course, side clinker, as well as any other clinker, is formed during the blasting period when the combustion zone of the fire gets hot enough to melt the ash. The combustion zone is right above the layer of the clinker on the grate; but the temperature of the fuel for 2 or 3 feet above the grate is enough to melt the ash of these side clinker forming fuels; where the ash of another fuel might not melt until it got down into the hottest part of the combustion zone. Therefore, it is possible sometimes to get around side clinker troubles by decreasing the flow of air through the fire while blasting, making a fire not so intensely hot. This may be done by cutting down the speed of the blowers or by opening the main blast less, so as to give a reduced pressure under the grate, or finally by reducing the spacing of the checkerbrick. Instances are quoted where machines which were very troublesome for side clinker have been cured by simply spacing the checkerbrick 2½ inches instead of 3 inches. This small change seemed to add so much resistance to the blast gases as to materially lower the temperature of the fire. Of course, the machine will make less gas, but there is such a loss of time in pulling out fires that there may be no loss in make after all, and at the same time the efficiency of the machine is not impaired by the bad fire. As little side clinker should be made as possible: First, by using a fuel which will not form side clinkers; second, by making so many down runs that the fire cannot heat up high enough in the fuel bed to form them. Side clinkers can be melted down on to the grate by throwing in a barrel or so of oyster shells or small limestone around the edge of the fire above the clinker.

After cleaning, the fire is coaled up full and an extra long blast (8 or 10 minutes) is made before the running is resumed. With regard to the hardness of the bottom clinker, with the kind of fuel we get nowadays, generally speaking, the harder the clinker the better. Clinkers can be kept soft by using lots of steam and by making few down runs, and es-

pecially by using a little steam while blasting. All these devices tend to make a dead fire and should be avoided. A fire to be right should be such that after a 4 or 5-hour run, when the bottom doors are opened the clinker will show red-hot in spots. If no fire can be seen you are killing your fire and probably making side clinkers instead of bottom clinker. Where a generator has no up-and-down make, the fire can be kept down on the grate only by cleaning every 3 or 4 hours.

No matter what the type of machine, the shorter the runs the better. The run should be about 6 minutes long, 7 or 8 at the most, although in extra cold weather it may be necessary to lengthen out the run, keeping the oil valve open, thus admitting a large quantity of oil when the machine is making but little blue gas, in order to hold up the candle power—a very inefficient method, however, and one never to be used except when the candle power must be gotten up at any cost.

Before leaving the matter of the generator, let us describe what the fire in a generator is like. We will take a fire of good coke. If you let the fire go out and then get in on top of the fuel and through the coaling door, shovel out all the fuel from the the top downwards and not disturb the clinker, but simply gather up the loose fuel as you go, you will find that the fuel is very little changed in appearance from what it was when it was put in the fire until you get down to within a couple of feet of the grate. At this point (the combustion zone) you find that the coke has been burning, but the fuel is still loose and not run together until you get to the solid clinker on the grate, perhaps a foot thick or more, after a day's run. Now, strange to say, that clinker is a solid sheet (saucer shaped) over the whole grate and frozen to the sides of the generator. You would say it would be impossible for the blast to get through it at all. And probably it would, but if you will scratch around over each cleaning door you will find holes about 4 inches in diameter through it. If the clinkering doors are closed and the blast turned on you will see that the air all comes through these holes. So that when the bottom clinker is once formed we really have a blowpipe at work in the generator over each coaling door, and this is what causes the lining to deteriorate so rapidly at this point. We ought to aim to keep this clinker broken up as much as possible, but it is not practicable to open up the machine to do it.

When a gas machine is left over night it is only necessary to leave the coaling door open an inch or so and the stack valve wide open. This will keep the fire from going out and will also let any carbon burn out from the checkerbrick, but if the bottom steam valve is not shut tight or if it leaks, you will probably find the fire out in the morning. When the gas maker leaves his machine he should always close the gas take-off valve. If this is not done the water in the seal might run dry. Gas would come back from the holder and burn at the stack. When this happens (and it sometimes happens when a machine is being put on blast also), it will be indicated by a big puffing flame at the stack. Of course, as soon as the water is made to overflow to the seal pot this will stop.

The take-off pipe and seal pot will need cleaning only every 2 or 3 months if the machine is run just right. In practice, however, it is best to open up the take-off pipe once a week and clean it out if there is more than a couple of inches of lampblack all around it. Before it is opened up the stack valve must be opened and the gas outlet valve closed and a 2-inch plug taken out from the top of the seal pot. If the gas outlet valve is not absolutely tight, seal it off with water. Then the gas must be driven out of the seal pot by filling up the whole thing, including the gas pipe as far as the valve, with water. If this cannot be done a large jet of steam should be introduced into the gas main just inside the valve and all of the gas be blown out of the pipe and seal pot. There ought always to be a valve at the outlet of the seal pot, but if there is none all of the gas should be blown out from the scrubber or whatever other apparatus is between the seal and the shut-off valve. A jet of steam would then be introduced into the take-off pipe right close to where it enters the seal, and while the steam is turned on the plate can be taken off the take-off pipe. The carbon is then cut out and it is prevented from falling down into the seal by pushing a close fitting pail fastened on a chain down into the dip pipe. The utmost care must be taken that no one opens a door or admits steam or oil to the machine while the take-off pipe is being cleaned, because a flame might flash back through the take-off pipe. There will be a ring of carbon under the water's edge. To cut this off a dipper is pushed down into the water under the carbon so that when it is knocked off it will not fall into the seal pot. In this way all the carbon is caught. If by any mishap big chunks fall into the seal pot it will be necessary to turn steam on to the seal pot and open the door, the steam can then be shut off and the water drawn out of the seal and the carbon fished out with a hoe. Before the seal is opened up at all it is well to insert a wooden plug into the take-off pipe and close up the cracks with fireclay. As there is heavy tar in the seal pot, it is a disagreeable job to clean it out, and, as above stated, it should never be necessary except when the machine is being rechecked. The accumulation of tar, etc., is kept down by drawing it off each day. The following is the method used:

Draw off all water from the little overflow pot and have a large stream of water running into the seal pot and overflowing, then open the draw-off cock on the bottom of the seal pot wide until the water stops overflowing. Repeat this 2 or 3 times. Don't draw off the pot unless the pot is overflowing, otherwise the air drawn up through the overflow pipe mixed with gas in the seal pot may be exploded, if, perchance, the water is drawn below the bottom of the dip pipe, as the mixture will float up through the take-off pipe into the hot machine. The heavy tar in the seal pot should be drawn off this way each time the machine is cleaned. Don't leave any chunks of carbon or wood or waste in the seal pot. They may float over into the overflow and stop it up. Then if the machine is shut down, or even while blasting, the seal pot will fill up with water, and unless the gas main is lower than the take off pipe, so that the water can get out through it, this water will rise up through the take-off pipe and get back into the red-hot checkerbrick. The steam generated will make a tremendous puff in the machine.

The principal precaution in running a gas machine is never to go on a run with the blast valve open or the gas will get back and blow up the blast pipe. Whenever it becomes necessary to quickly pull the machine off the run, owing to back pressure or other trouble, the oil valve should be closed first and then the steam valve. In an emergency, however, the stack valve can be raised before either the oil or steam is shut off. Many seemingly mysterious occurrences around a gas machine can be explained by one of the preceding statements.

Let us consider the matter of the combustion of the fuel when the blast is on. When the fuel is burned in a fire where there is a great deal of air present, the carbon unites with the oxygen of the air and forms carbon dioxide and the fuel heats up rapidly. But if the fire is deep and the air is not forced through it exceedingly fast, only the lower portion of the fuel burns to carbon dioxide, which is a gas that can be burned. The upper part of the fire does not get very hot. So when the fire is being blasted you are really making gas in the generator and passing this over into the carburetter. Now by admitting air at this point the carbon oxide burns again to carbon dioxide and this causes great heat, which raises the temperature of the checkerbrick. One point about not having checkerbrick enough is that, in order to get the fire hot enough to make good blue gas, if all the carbonic oxide formed during the blast were burned in the checkerbrick they would get too hot, so it may be necessary to not pull out the secondary blast but instead let this good gas go through and burn at the stack valve—which is, of course, a waste of fuel. Likewise, if the blast pressure is too low you will have slow combustion in the generator, requiring a long time to get the generator hot and making an excess of carbonic oxide to be burned in the checkerbrick.

Now, when the machines are on run the action of the incandescent fuel, in uniting with the oxygen of the steam, likewise forms carbon dioxide at the bottom of the fire and this carbon dioxide passing up through the fire is reduced to carbonic oxide, just as it was during the blasting period. But if the fire is not hot enough a large amount of the carbon dioxide will pass over with the gas, thus impairing its value. The decomposition of the steam and the reduction of the carbon dioxide absorb heat very rapidly and the fire soon becomes so cool that the percentage of carbon dioxide which works its way into the finished gas increases to a prohibitive degree and the run must be stopped and the fire blown up again. In the checkerbrick at the same time, the changing of the oil from a liquid into a vapor, and later into a permanent gas, has absorbed considerable heat from the checkerbrick so that they also are ready to be heated up again. In order to get a better understanding of how the various reactions take place, let us assume that the fire consists, not of incandescent fuel, but of pieces of firebrick which we managed in some way to get red hot. Now if we pass steam through these bricks we get the steam very hot—superheat it we say—and as soon as we cool it down again it goes back into water, so that we could run all day and our holder wouldn't go up an inch as far as the blue gas was concerned. This is just what happens when the fire is allowed to get very dirty, or when the fuel in use is such that it coats over with ash and thus prevents the steam from getting into contact with the carbon. Black spots in the fire likewise indicate that steam is getting through without being decomposed. This steam absorbs heat from the fire and gets very hot itself, but it does not begin to absorb as much heat as does the action of decomposing steam

into permanent blue gas with a good fire, so that the fire does not cool down much during the run, and the condition keeps getting worse—the superheated steam passes over into the checkerbrick hotter and hotter each run and finally gets the checkerbrick at the outlet of the machine melting hot. If, on the other hand, it was good blue gas that was passing over into the carburetter the temperature of this blue gas would be comparatively low—in fact, remarkably so, because the decomposition of the steam absorbs heat in the formation of the blue gas so rapidly that the temperature falls very low. Consequently, with a dirty fire we make very little blue gas and also get the checkerbrick excessively hot—your make of gas is small, your oil is burned up and carbon from the oil is deposited on the checkerbrick, which soon clogs the machine right up. The dirty fire likewise offers more resistance to the passage of the blast than does the clean fire, and so, as stated before, the combustion is slower in the fire producing more carbonic oxide than can be properly burned in the checkerbrick and a waste of fuel results.

Let us assume there is no generator on the machine and consider only the checkerbrick part of it. We will assume that we get the bricks hot—not very hot this time—in fact, not even quite red-hot, and pour water on these bricks, it will turn to steam and the steam will pass through these bricks and become superheated, but the moment it is cooled down again after leaving the machine it will turn back into water.

Likewise with oil—as long as these bricks are not pretty hot we could pour oil on them all day long. It will be vaporized and pass out of the machine as vapor, but the condensers would cool the vapors down again, they would turn back into oil and we would not make a foot of gas. But if we have the bricks hot enough these vapors from the oil are so broken up (we say the oil is cracked) that a fixed gas results. In a way this fixing is decomposition, but not the same kind of decomposition as is the case of the steam in making blue gas. Instead, the hydrocarbon vapors give up part of their carbon in the form of exceedingly small, dustlike particles which go down with condensible vapors when the gas is cooled, forming tar. The remaining part of the hydrocarbon vapors is largely permanent gas. Other changes take place in actual working, due to merely a change in the so called structure of the hydrocarbons and again due, perhaps, to the action of the blue gas on the vapors. Some even believe that the excess of steam which passes over from the generator with the blue gas has a beneficial effect on the hydrocarbons, and others claim likewise that using steam to inject the oil is a benefit rather than a detriment.

Let it not be thought that a gas can be so well fixed—in other words, made so "dry"—that there will be no condensible vapors left in it; on the contrary, a great many vapors go unfixed and drop out in the tar and keep dropping out along the mains wherever the temperature gets low enough, causing a drop in the candle power, and even at the burner a large part of the so-called illuminants in gas are not fixed gases, but merely hydrocarbon vapors. These vapors which drop out have great illuminating and heating value, and it is a pity we can't keep them in the gas. But the better a gas is fixed the better the candle power will hold up, and what is perhaps more important nowadays, the higher will be the heat value of the gas for a given candle power. Right here let it be understood that no water gas machine turns out a gas which will not lose a good deal in candle power between the inlet of a holder and the consumer's burner when the temperature of the main is down as low as it gets after a prolonged period of cold weather (see Bibliography, 55), the drop at times in candle power being as great as 25 per cent. or more. Unfortunately a great many machines are shy on fixing capacity and the above condition is aggravated until it is almost a hopeless task to try to keep the candle power up under these conditions.

Now it will be seen that the first checkerbrick with which the oil comes in contact merely vaporize the oil. As a matter of fact this vaporizing of the oil is where the great amount of heat is absorbed and consequently these bricks cool off very rapidly. On the other hand, the bricks which fix the gas seemed to lose no heat, the hot gas on the run coming over from the carburetter being sufficient to keep their temperature just right—nay, the hardest part of running an ordinary gas machine is to prevent these brick from getting too hot. Anyone can see the advantage of having these two processes kept separate, so in most machines a carburetter is provided to vaporize the oil and a separate superheater to fix it. When blasting the machine the secondary air is admitted only to the carburetter, thus heating it up, and secondary air is never admitted to the superheater except when the machine is being heated up after it has been out of use for a time and cooled down very much, or when the machine is new. The trouble is that the hot blast gases coming over from the carburetter get the superheater too hot, even though no secondary air is added at that point. Some machines are built, therefore, with 2 stack valves, the regular one on top of the superheater being used only when the machine is first being heated up, and at all other times the blast gases passing out from the carburetter through another stack valve, not passing through the superheater at all. Some operators even put a large jet of steam into the superheater during the run to keep the temperature down.

The chief purpose of the up-and-down run is to keep the fire uniform. The aim throughout the whole machine should be to keep the conditions uniform. The heats in the superheater will hardly change at all; the carburetter, then, is the place where the bricks are very hot at the start of the run and cold at its end. Probably a better machine could be constructed with the generator and superheater the same as at present and the carburetter twice the present area, the blast gases passing out from the carburetter through a separate stack as mentioned above. This would give a quick gas with little carbonic oxide formed in the generation, a large make, and the oil would not be over-fixed. Remember, it does not take a very high temperature to fix oil, the only point is to get every bit of gas exposed to the action of the checkerbrick. The bricks in the carburetter would also remain at a more nearly uniform heat.

Here let us consider the way in which the oil is put into the machine. It must be so put in that it is spread over the whole area of the checkerbrick. If it is put in in spots, these will get so cold as to be black and the rest of the checkerbrick will be getting white-hot. In a short time this will clog the checkerbrick up with carbon and the oil will run down in a stream and ruin the condition of the whole machine, not to mention the great loss in efficiency. The black spot where the oil has cooled down the brick fills up with carbon remarkably fast. In all other cases we have said it was the excessive heat which clogged up the brick with carbon. While the variation of heats in the checkerbrick can be wide, the fact of the matter is that carbon will be deposited, either from excess of heat in the bricks during the run or else from the oil itself which remains in the cold parts of the machine probably burning during the blasting period. Right where the oil enters is no doubt the most important place in a gas machine. If the bricks get coated over badly or slagged and run together or crumbled up, or a bunch of carbon forms under the spray, the spray must be removed at once and this carbon or bad brick taken out so as to again expose good, clean brick to the oil entering the machine. Likewise the moment anything goes wrong with the oil spray it must be taken out and made right. A gas machine with the oil entering badly is as sickly a proposition as one can run up against, and it generally baffles the inexperienced operator to find out just what is the matter. The oil spray must always be removed and carefully examined at least once a week, and when running the oil spray must be continually under the watchful eye of the gas maker. While it is possible to clean out the carbon from the checkerbrick where it has been caused by excessive heat by "burning it out" with air, the carbon which forms where the oil enters is generally mixed with dirt and slagged over so that it can't be burned out and, moreover, these bricks don't have a temperature high enough to burn out. To burn out carbon requires that the bricks must be quite hot so that the carbon will be kindled, otherwise the cold air will only cool down the bricks more and more and they won't burn out at all.

Probably nothing else can spoil a good machine quicker than to have the oil enter the wrong way, not even a dirty fire. The oil should be sprayed over the whole surface of the bricks, and this is accomplished by forcing the oil under pressure through a spraying nozzle or by using a rapidly revolving spray or by injecting the oil with steam. If oil is heated even to 250° or 300°, just a little of it turns to a vapor, hence with hot oil this vapor issuing from the nozzle together with the liquid oil causes a more effective spray, and this is about the only advantage of heating oil. If oil is to be heated it must be measured before entering the heater. A release valve on the heater will always let out a good deal of oil when the machine is not on the run, due to the rapid heating of the oil. This oil, of course, has been measured but does not enter the machine, which throws the measurements out. It is not practicable to measure hot oil on account of the vapors formed and trouble with the meters.

The oil ought not to be admitted immediately after a run is put on, but the blue gas should be allowed to circulate a few seconds so as to take that sharp heat off of the bricks. The oil ought to be forced in the first half of the run as quickly as possible and then gradually slacked off when the make of blue gas is falling off. As stated before, a minute of steam run must be made at the end of the run to carry out any oil lying in the machine.

On top of the seal pot a tap should he made and from this a ¼ inch

pipe should be led without traps to a point where the gas maker can conveniently operate a quick opening cock on it to enable him to see exactly what kind of gas he is making each run by letting it blow out a few seconds. Never make a run without watching the color of this gas. When the machine is in good condition the color of the gas will be a rich yellow—you might say golden—if it is whitish, the gas is not properly fixed. If it is brown, some of the oil is being overcracked, and if the machine is making lampblack in excess the gas will appear dark brown, or even black. If it is not possible to change the heat in the machines so as to stop making this dirty gas it is probable that some of the checkerbrick are plugged up with carbon; likewise a reddish flame or lots of sparks coming out of the stack while blasting indicate that the checkerbrick is plugging up with lampblack. Generally speaking the heats are controlled by the length of blast alone. It is not good practice to raise the generator blast less in order to keep down the heats. If bricks are too hot and the fire still needs blasting, simply blast out through the stack without using secondary air. If on any run the machine shows very excessive heat, use lots of steam, put the oil in very heavy and lengthen the run out. The same condition will arise from a dirty fire or from bad fuel; but it shows the same thing, that the oil is being burned up. The odor of this little stream of gas will become so familiar that the gas maker can tell the quality of his gas without looking at it. Either over-fixed or under-fixed gas has a sour odor, while a gas that is just right has rather a pleasant smell, even its foulness being deadened by the tar smell.

By allowing a small stream of this gas to impinge on a piece of white paper, or better still, on a bright trowel, the presence of lampblack or free oil can be seen at once. The trowel test will also show up any excess of steam. When the steam is right there will be just a slight dew on the trowel. Checkerbrick are usually placed as follows:

A starting tier is laid in parallel rows on edge, the next tier is at right angles to it, the third tier is laid in the same direction as the first tier, but the rows of bricks are directly above the spaces in the first tier—staggered, we say—and this scheme is followed out all the way up. Instead of staggering the bricks over the spaces the rows may be placed directly over each other, making flues, if it is desired to have the machine blast freer. The idea in checkering should be this: The gas ought to go rapidly through the checkerbrick when the fire is turning out the proper amount of blue gas. In this case the heats can be high. If with a bad fuel the make of blue gas is small, by lowering the heats no harm will be done if the gas does travel slower through the checkerbrick. In extreme cases a great excess of steam can be used to carry the oil gas along. When checkerbrick are spaced close, the speed of the gas through them is increased, but the gas is brought into more intimate contact with the brick; there are also more brick for the same amount of gas made, and these bricks will be hotter, especially so because the increased resistance to the blast makes the speed of the blast through the fire slower. More carbonic oxide is thus made to be burned in the bricks.

Widening out the spaces does just the opposite. For coke 2½ inches is nice spacing. For coal, on account of the amount of dust carried over from the fire, 3 inches is preferable. When naphtha is used it is sometimes customary to space the brick 4 inches apart. In re-checkering, don't forget the sight-cocks. Always put a rod through them right across to the other side of the machine. The checkerbrick around this will form a flue through which the heats can be watched across the whole machine.

The sight-cocks should be watched carefully, chiefly to see that the oil is being distributed right, but also to see if the heats are being maintained right in the different parts of the machine. A black spot, or a too bright spot, in the carburetter will show right up. A superheater that is too hot will show up quickly through the sight-cocks, although generally the appearance of the flame at the stack when blasting will be a better index of excessive heat in the superheater. The carburetter ought to be a bright red and the superheater a little hotter—you might say orange.

When the oil is being cracked up, we said carbon is being set free in minute dust particles in the gas. If the machine is not working properly not all of this carbon will go down with the tar vapors, but some will collect on the sides of the take-off pipe as far as the seal pot and choke it up. Fortunately the gas does not deposit carbon on the sides of the pipe after it has passed through the seal pot, hence this is often called the washbox. When the take-off pipe is choked up the gas cannot get out of the machine as fast as it is made and the stack valve will be lifted from its seat like a safety valve and the gas be lost.

We spoke of burning out carbon from the checkerbrick of the machine when it was getting clogged up. This is done by getting the brick good and hot by regular blasting and then, with no blast on at all, simply removing the plate from the bottom of the superheater to allow the air to flow up through the hot bricks and the carbon, and if the machine is badly clogged up the secondary air can be put on the bottom of the superheater and the pressure will force it through more rapidly.

Gradually the carbon will burn out, getting hotter and hotter and burning faster until big sparks of red-hot carbon will show at the stack valve. If this is done every time the machine lies idle for a while, it will keep the machine in good condition and avoid that excessive heating up which burning out a large amount of carbon entails. Checkerbrick have been made melting hot by burning out the carbon around them, and instances are given of the shells of machines being bursted by the expansion. Certainly the machine is thrown out of balance so that it may be necessary to make a few steam runs on it; otherwise there might be more carbon deposited on these very hot bricks the first few runs than had been burned off.

It takes a pretty heavy deposit of carbon to show on the pressure gauges; but it is necessary to keep even the smallest amount of carbon burned out, because this carbon heats up so intensely during the blast that the lampblack is added at a remarkable rate each run. Every opportunity should be used to burn the machines out a little at a time.

But no amount of burning out will take the place of the frequent changes of checkerbrick which are essential to the highest efficiency. A machine that runs continuously every 24 hours ought to be re-checkered every 30 or 40 days, and those which run intermittently in proportion. Moreover, if there is any reason to suspect that a machine is not working right there should be no hesitation about taking out the brick and replacing it. If the brick are in good shape they are simply dusted off and replaced and very few new ones are needed. Reject only those that are glazed or slagged. The cost of re-checkering is small, but a slight reduction in oil efficiency runs the operating cost up very fast. Unfortunately it is not the length of time alone that causes a machine to depreciate in efficiency. A machine just re-checkered may be spoiled the day it is put on by wrong handling of it or by trouble with the oil spray or very bad fuel.

In handling the machines the operator should make all changes of valves quickly; especially in coaling up and in cleaning the fire everyone should work to get the machine closed up as quickly as possible. The loss in make on a machine due to the slow movements of the men handling it is astonishing, and yet not so much so when one considers how many times the changes are made in a day's run.

In many small works the gas maker is the one who is depended on to maintain the candle power and to keep gas in the holders at all times. It is up to him to watch the weather carefully and when he sees a cold wave coming get his candle power up immediately, or when the weather is suddenly getting milder, cut his oil so as to save as much as possible. He must remember that his candle power is supposed to be right, not at the works but at the consumer's burner, and that at times he may have to make 30-candle power gas to hold the light at 24 at the consumer's burner. His results may seem poor to him under these conditions, but they may be very good after all. With a sudden increase in temperature he may be able to deliver 24-candle power gas by making only 20-candle power. The photometer ought to be located at least a mile from the works and yet where there will be someone to read it often. Then, too, the gas maker should figure out his results from day to day, noting how much fuel and oil he is using and figuring his candles per gallon each day and keeping a record of them. He should also keep a diary of the method of running and kind of fuel and oil used, so that when he learns how to best handle a bad fuel or a tricky oil he can refer back to his record when he meets a similar condition and avoid the necessity of long experimenting to determine the same condition over again.

Gas machines have a peculiarity common to all machinery. You may build a row of them exactly alike and connect them up exactly alike, and checker them alike, and try to run them alike, and yet there is always a difference in them, and one machine is always the good and another the bad machine in a generator house. And just as it is difficult to explain and correct such a difference, so it is difficult to describe a method of running that exactly fits all cases. The gas maker must learn to know his machine and its peculiarities.

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(11) 2-16-78. The Paraffines in Water Gas as now Made by the Tessie Du Motay Process in New York. Henry Morton, Ph.D., and Wm. E. Geyer, G.S.
(12) 11-16-78. On Water Gas. Chambers. Discusses some of the earliest water gas processes.
(13) 12-2-79. The Lowe Water Gas Process. W. H. Pearson. Discusses Lowe water gas as first made with only a generator and superheater.
(14) 12-16-80. The Working of the Lowe Process at Toronto. Pearson. Shows principally how the early water gas acted upon leaving the machine.
(15) 3-16-86. Experience in the Manufacture of Water Gas. J. H. Rollins. Gives results at Worcester on Granger Process.
(16) 11-2-87. Water Gas. Walton Clark. Gives the best methods of operating machines as equipped at that time.
(17) 3-11-89. Experience With a Springer Cupola. H. S. Chase. Shows the idea of putting steam in on top of the fire.
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Discussion.

Vice-President Runner—We have listened to a very interesting paper and I hope a free discussion on it will bring out many points of interest. Will Mr. Quackenbush open the discussion?

Mr. Quackenbush—I want to say, first, it is a pleasure to listen to a paper of this kind. I have never heard or read a paper before that covered the elemental points as fully as this one does. It is hard to discuss a paper of this kind that simply states cold facts, but does not really bring out anything strictly new. I will say, however, that I have been running water gas machines for some little time and find there is a good deal for me to learn from this paper. Some few little points in the paper I do not exactly agree with. I would suggest that the closing down tight of the stack valve may be right in some generating houses where there is plenty of air circulation, but on a hot day in East St. Louis it would be a pretty hard thing to do. What we do is usually to put a small bar of iron under the stack valve and raise it slightly, allowing just enough circulation through the fire to keep the gases from backing through the cleaning doors. Another point that I do not agree with at all is where Mr. Battin says: "The firebrick for lining or checkering need not be of high grade; almost any firebrick will do, providing they are of uniform size and not too easily broken." I made at one time a little test of different firebrick used in recheckering. The firebrick for recheckering has not to stand the usual test of the firebrick. Firebricks usually have to stand heat alone, but in recheckering, the firebrick not only must stand heat, but the sudden shock of cold oil. In our tests, carried on through several different kinds of brick, we found one brick would have a great deal longer life than another We carried out that test further by taking a certain number of bricks, and having heated them in the furnace to about the proper temperature, dipped them in cold water and found that some of the highest grade only stood half the dipping in the water that some of the cheapest brick did. Another point that I want to emphasize is, the doing away with noise about a gas plant. I think that should be carried out in every way. It breaks up your working force to hear these explosions and everybody jumps. For 15 or 20 minutes afterwards the working force is disorganized. I think all loud talking and noise should be done away with around the works, if possible. I know I feel it when I hear a chap yell and there is no need of it. Let them walk a little ways and whisper. On the question of the loss of candle power I do not exactly agree with the paper. I realize that during certain periods of the year we get a large drop in candle power between the holder and the consumer's meter and at other times we get an increase, which is especially true of Texas oil. Many companies are now

using a freezing coil in treating candle power to assist in regulating the operations of the machine to make a gas least susceptible to a drop in temperature. I would like to ask Mr. Battin what kind of oil spray he uses. Whether a patented one or one of his own manufacture? If it is one of his own manufacture, to describe it. I would also like to ask him if he uses a pyrometer or anything else to determine his heat and to keep it uniform? That is about all, only I desire to say I am greatly pleased with this paper and am going to study it closely.

Mr. H. S. Lee—This paper has about exhausted the subject. I agree with Mr. Quackenbush, though, that it would not be wise to take any kind of firebrick put in any place. It is certainly a fact that some brick stand hot air and work better than others, particularly the higher grade of brick will crack under such conditions where cheaper brick will not. I suppose Mr. Battin's contention is based on the fact if you have got the poorer brick there is not much difference in its life, and before you break it up it will have about worn out, which is probably true in a great many cases. With regard to putting plugs in the blast pipe. It is impossible to drive plugs into pipe so they will stand the same resistance before they come out. You are leaving yourself in great uncertainty. I would rather have a flap-valve fitted with a rachet. In case an explosion occurs in the blast pipe the flap-valve opens to release the pressure, and it cannot come back on you at all until you release it. Beyond that I have nothing but commendation for the paper. It is a well written one.

Mr. H. L. Rice—Mr. Battin mentions the preheating of oil and states in that case naturally it is difficult to measure the oil. This preheating of oil is sometimes necessary and it is very essential to provide the relief valve spoken of. In that case I think it would be useful if he would explain in what way he gets at the amount of oil he uses for a run when the relief valve opens and releases part of it during a blow.

Mr. W. E. Hartman—This paper impressed me as a valuable one because of its thoroughly practical nature. It seems it is a paper we can put into the hands of our gas makers with great profit to our companies, since the subject is treated from a practical standpoint so an ordinary gas maker can thoroughly understand and appreciate it. I found in running water gas machines that a photometer is a very valuable adjunct to a machine if the photometer is kept running all the time the machine is in operation, and is set so that the gas maker, by reference to a chart, knows the candle power and the oil results he is getting. I have also found gas analysis valuable; that is, simply an analysis for the carbon dioxide, taking a sample from the top of the generator. The percentage of carbon dioxide is a very good index of the condition of the generator fire and would be the first thing I would look for in case I found the oil results poor. Along the line of safety appliances, I believe it is a good plan to keep a set of duplicate blast pipes, fitted with flanged ends, all ready to be installed. I saw one blast pipe badly damaged by an explosion and replaced in short order by this means, and the value of a duplicate blast pipe so impressed itself upon me that I consider it almost a part of the machine. As a wrinkle, I have seen the condenser used as a feed water heater. The suction pipe of the boiler feed pump was connected to the condenser near the top. This economizes in the use of water. That, of course, would only be practicable where there is no feed water heater. The paper was interesting to me and is very valuable because of its practical treatment of the subject.

Mr. Rhoades—I certainly agree with the other gentlemen who have spoken on the value of this paper, for it is especially valuable to those who have had experience with water gas machines. It covers the ground thoroughly and brings out many things that bother the water gas maker. There are several different points concerning which I would like to ask questions, and probably they will bring out more valuable information during the discussion. Do you ever change the spacing of your checkerbrick in the carburetter from larger openings at the bottom of the carburetter to a closer check at the top, and with what results? Mr. Battin spoke about the amount of steam admitted on a run. I would like to ask if he has a gauge on the steam line leading to the generator showing the pounds of steam going into the machine, or does he take the gauge on the boiler line as the index? He spoke of the length of run. We are using a 7-minute blast and a 5 minute run, the first 4 minutes being given to putting in the oil, the oil running in faster at first, and use from 1 to 1½ minutes for cleaning out the machine as indicated. Would we gain anything where we have only about 3½, possibly 6 hours, straight running, by shortening that run to 6 and 4, or by lengthening it out to possibly 10 minutes blast and longer run? I would also like to know what the data would show with regard to fuel per 1,000 feet of gas made, when ordinary gas house coke is used; that is, where it is liable to be broken up into small particles with a large amount of breeze? Does he advise screening the coke before putting it in the generator, or allow it to be used with coke and breeze mixed? In regard to clinkers on the side of the machine. The first month or two we ran our machine we were bothered by clinkers forming on the side quite rapidly, 2 feet up from the grates. To avoid that I had my water gas maker at the time of coking to use just a small amount of breeze next to the linings to drive the blast in towards the center more and keep it away from the linings. Since we have tried this scheme we have had no trouble at all with the clinkers on the sides and although we have run about 2 years I think at that point you would not find the linings cut back more than 1 inch. We found it very helpful and it has given good results. In fact, before we used it we had to watch very carefully or we would have clinkers form, leaving only from 3½ to 4 feet open in the center which, of course, is entirely wrong. On this same machine we have no spray for allowing steam to come up under the center of the grates. The steam comes through a 1½ inch pipe which projects probably 3 or 4 inches into the blast chamber below the grates. It is supposed the pressure of the generator fuel is enough to spread the steam and let it come up with equal pressure at all points of the grate area. I would like to know whether a steam jet, or nozzle, 1½ inches in size, placed on the center of the blast chamber, and possibly 6 inches below the grates, would be of any advantage in distributing this steam? Within the last 3 months we have had trouble with the steam working up through the fuel bed on the side opposite the steam opening. This causes a loss of fuel and a great loss in the efficiency of the machine. I intend to change to some form of central distribution, and would like to know the results obtained by those who have tried the use of a nozzle or jets. I would like to ask this question with regard to checkerbrick: After they have been in the carburetter, we will say for 2 recheckerings, and you find the brick carbonized at least 1½ inches in from the surface, will they give you the same benefit in cracking the oil as a brick that is porous; or, on the other hand, do you gain by having them carbonized ½ inch and not allowing absorption of the oil? In regard to protecting blast piping from shots. I had a piece of poplar cut down very thin, only $\frac{1}{16}$ of an inch, and scraped still thinner in the middle. This was placed on the end of a tee in the blast pipe, where it turns at a square corner before entering the machine. I happened to notice it the other day as I passed and found the center of that wood pushed out by the concentration of the blast. There is no doubt, if we had a shot in that blast pipe, it would blow out this disk of wood giving a clear pipe, thus preventing destruction by collapse as well as by explosion.

Mr. E. E. Morrell—Does Mr. Battin heat his oil, and if so, what advantage does he get from heating it before it goes to the machine? I would also like to say in connection with this water gas business that I know a works using a pump. The water is taken out of their condensers and it circulates around the holder tank, so in the winter time no steam is kept in the steel tank. I know that in the Peoples Company, of Chicago, a very novel method of grates is used, and I think it would be very interesting to all here to have Mr. Battin explain the method of these grates. I think they are the only ones using that kind of grate, and as the gentleman from Springfield asked with regard to the distribution of air blasts under the grates, they also have a method of distributing the air through a set of hollow bars on which the grates rest. I think all of these points asked about are of great interest to members here.

Mr. F. R. Persons—I have enjoyed Mr. Battin's paper, and am sorry he did not write it 26 or 27 years ago, as it would have been of some use to me then; everything is so different to-day from what it was when I was making water gas. Perhaps a little bit of the history of the early days might be of interest. I started making water gas on a 4-foot shell, 36-inch lining, 18 inches on the sides, then about an inch air space, so our coal space was 8 or 10 inches, and my instructions were never to carry fire over 12 or 14 inches in depth, so as to avoid making a considerable amount of carbonic oxide. We did not know much about clinkers then. We started the fire in generator; we made a blast of 25 minutes, when the fire would be all clinkers and we would have to shut down, clean the lampblack and tar out of the wash-box and burn off checkerbrick in superheater. At that time we used 72° gasoline, now so valuable that people are afraid to carry even a little of it in their pockets for fear of being robbed. [Laughter.] In the first plant I worked a purifier was considered unnecessary on account of the exceedingly perfect material we were using. Of course, we drove the people all out of town on account of sulphur. We eventually put in the purifying boxes, using wet slacked lime. We had 3 layers of lime about 3 inches thick, and each layer was covered with water. After a few minutes, of course, holes would be blown through the layers and the gas unpurified, or the back pressure would be so great that we could not get our oil in the generator. We put the oil in 4 places on top of the generator and, of course, at the end of each run. The top of fire was all coke where the oil dropped through. I think Mr. Battin says we cannot get blue gas in the holder. I want to tell him I could. [Laughter.] This paper is very interesting, and I have no doubt it will do the coming generation a great deal of good. The one thing I never could agree to is the superheating the enriching material. Of course, there are certain grades of oil where it may be done at certain seasons of the year. I had 5 years' experience selling gas making material, and I don't know of any place where the results were better through preheating the oil. When you preheat the oil you make it into a limpid material which will go through the superheater and show up in over flow. If you put it in cold it is all cracked up fine. A good many years ago, at Toledo, Mr. Faben put in his carburetter a solid cone of iron with a little cup at the bottom; he put his oil on top of this cone in a solid stream under pressure. We examined frequently and never found any lampblack or carbon accumulation on the cone or in the carburetter. It has been in use at least 15 years, and I believe that is the proper way to break up the oil. It can be illustrated by a piece of glass. You take a piece of glass partially heated and put it into a hot furnace and it will melt and run through the fire; but if you put that glass in at a low temperature it simply cracks into a thousand pieces.

The Secretary—There is one question I would like to ask Mr. Battin. In his paper he says: "As soon as foamy tar shows on the tar separator, either the heats are too low or the machine is getting in bad shape. The tar itself should settle out quickly and sink to the bottom and be a good heavy black tar that with a little heating can be freed from practically all the water it contains. A thin, brownish tar is a sign of bad working somewhere." I would like to ask him when he finds that indication in his water gas machine what trouble he would first look for? Then, as to the remarks made by Mr. Rhoades with reference to putting in breeze around the brickwork of his generator. I will ask him how he gets the breeze in so as to get the result desired?

Mr. Rhoades—Our machine has a top coking door so the breeze can be scattered very nicely with a long-nosed charging scoop. The breeze is put in at time of coking after cleaning the fires when the clinker line is most exposed.

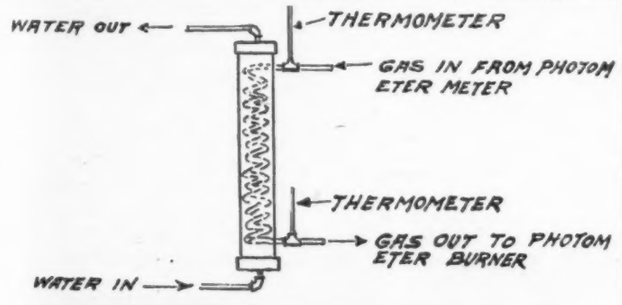
The Secretary—My reason for asking that was this: In most water gas machines the loading up of the generator is done with a charging barrow and if you loaded up with a charging barrow I wondered how you got the breeze around the walls of the generator.

The Chair—If there are no further remarks on this paper I will ask Mr. Battin to close the discussion.

Mr. Battin—This paper was gotten up at the request of our Secretary so it could be handed to the gas makers to read and use. It is so elementary that I hesitated about reading it before this Association, but I am glad some points have been brought out in this discussion which I am able perhaps to answer. I will take them up in the order in which they were asked. Respecting closing down the stack valve tight to clean the machine. I do that in my works, but then, you know, I have some 6 or 7 associates, some of whom use a different plan. They either have a 2 inch cock in the top of the generator which they leave open, or else they put a wire or rod under the stack valve. Either I have an exceptionally good generator house, or other conditions make this unnecessary, because we don't get enough heat or flame out of the cleaning door to bother us at all in cleaning the machine. As to firebrick. There is another point at which I am entirely at variance with the rest of my fellow superintendents. In other words, I believe that almost any firebrick can be used in a water gas machine. I have tested brick under all conditions, having used every brick anybody recommended. For lining generators I have used chrome brick at $175 per 1,000, and magnesite brick at $165 per 1,000, and all the grades of Pennsylvania brick. I have used the best grades of brick of 4 different manufacturers in St. Louis and have used brick made near Chicago, some of which are supposed to be a very low grade of brick, and in each case I have lined one part of the generator with standard brick and the other part with something else. Likewise with the checkerbrick. Sometimes I checkered one-half of the carburetter with one kind of brick and the other half with an entirely different kind of brick, and sometimes took the brick and distributed them, one here and one there all through. I found no difference. My people do not agree with me because they are now buying a somewhat higher priced brick, but I can say that the best result we ever got we got last year and it was on the lowest price brick we ever bought.

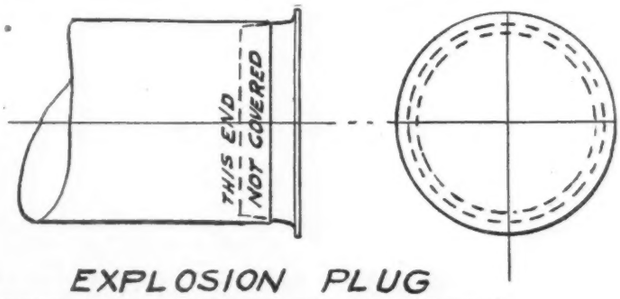
Mr. Quackenbush—I want to say that has been my experience. The poor brick we got were as good as the best, and we lined the machine half-and-half, taking $18 and $30 brick.

Mr. Battin—Of course, it must be really firebrick. I find the cheaper brick as good, if not better, than the highest priced brick. I only suggest this because I know the tendency among gas engineers is to try to get the best of everything. That is one thing about the gas business and gas engineers; they always try to buy the best and will pay twice as much if they think they can get better firebrick. With regard to the loss of candle power and the use of a freezing coil. We do not use a freezing coil, but on each photometer we have a coil of ¾-inch pipe wound around a 3-inch cylinder to form it, and this put into a 6-inch casing through which we circulate water from the city mains at a rapid rate. The water in the city mains is the same temperature as the gas gets in the street mains when it goes to the consumer's burner. I present a diagram of condenser on photometer. In going through this



CONDENSER ON PHOTOMETER

coil the gas is cooled to a temperature as low as it will get anywhere between the inlet of the holder and the consumer's burner. Even in zero weather the gas in the holder does not get as cold as it does later in the street mains. There may be exceptions to this rule but I have never been able to find them. I find that even when the gasholder is large, and the make of gas small, we never get the temperature of the gas in the holder as low as it gets in the mains. The candle power we get with the condenser corresponds with what we get miles away from the works, so it gives us a very exact idea. The man in charge at the works can tell in a minute what candle power he is able to deliver at the consumer's burner. We do not freeze the gas, we simply get it down to the temperature of the water in the mains. In the summer the water is higher in temperature. Now it is about 36°, so we cool the gas down to pretty nearly 36°. It has always been the tendency of builders of first-class apparatus for the making of gas to claim to be able to make gas, no matter what materials they used, so it would not lose a great deal of its candle power when going through the mains and being cooled down. They cannot do it. As to the oil spray, we use different ones. I use a patented revolving spray and believe it has been adopted by nearly all the other superintendents, but generally the 3 shell machines are fitted with steam injectors, or with a spray with a sort of a disk pierced with little holes, and where those machines have been installed they use that spray. We do not use any pyrometer. Where we have tried them we have not been able to get much out of them. Respecting the plug in the blast pipe and the question of a duplicate blast one. We take a light, galvanized iron plug or cap, shaped something like a hat, that fits in the pipe and is driven in with a little hammer. I present herewith an illustration of an explosion



EXPLOSION PLUG
MADE OF NO. 10 GAUGE G.I. AND DRIVEN INTO PIPE WITH LIGHT HAMMER

plug. We placed those some 7 or 8 years ago. We do not run our works there without blast pipe explosions once in a while, any oftener than anyone else does. Since we installed that cap we have never had a blast pipe burst or collapse, and I think they are the right thing. I know from actual experience that a cap is all right and it is not necessary to carry a duplicate pipe. In fact, in large works, a duplicate blast pipe does not insure you that you will go along without shutting the works down. I am informed that one large works had to shut down for a day because the blast pipe blew up, and while they had a duplicate set of blast pipe it was not possible for them in the short time they had to get the pipe up and keep gas in the town. As to heating the oil. We still do that in some cases and always have heated it, until the last year or two; I was always prejudiced against it, but because of the fact that on a good many of our machines the oil must be injected upwards, it seems that the oil issuing, together with light vapor, makes a more effective spray. So, in these cases, we still heat the oil, but where we have a good, large area, and where the oil is sprayed down, we don't heat it now, and our results have been a little better. With reference to measuring the amount of oil used per run. When you have the release valve on the heater (this is just an ordinary valve such as is put on the cylinder of any engine) you set it so it carries, say, 80 pounds. It is necessary to examine that release valve as regularly as you do the oil spray, for it soon clogs up. We find this. When you are using a large quantity of oil on the machine, you put say perhaps 100 gallons of oil for a run through the meter. It goes into the heater and probably 25 gallons of that releases back, so you get only 75 gallons in the machine. On the other hand, if you are only trying to get 50 gallons in machine, by using 60 gallons you get enough in, because only 10 gallons under that pressure are released back. No matter how much is used the ratio of release back is nearly constant from day to day. If you want to get in 75 gallons by using 100 gallons through the meter you get in 75 gallons each run. Of course, we measure our oil tanks every day to get the actual oil used.

Mr. Robb—Mr. Rice's question was, how you ascertained what oil got back from the release valve?

Mr. Battin—We do not ascertain it. If you want 75 gallons in the machine you put 100 gallons through the meter and 25 gallons will probably go back; but if you want to get 50 gallons in the machine it is only necessary to put 60 gallons through the meter. By experience you learn how much must be put through the heater in order to get the right amount into the machine.

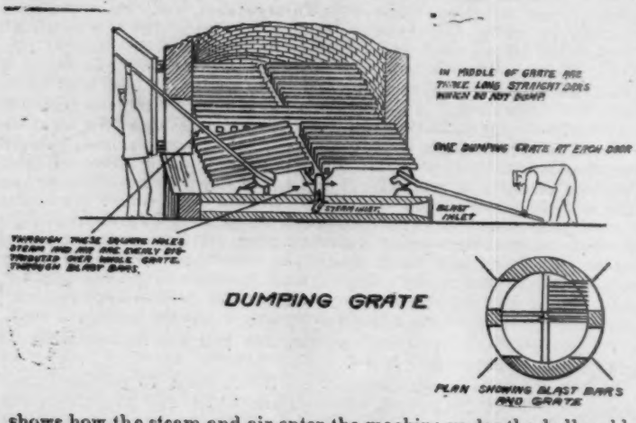
Mr. Rice—I understand the oil released flows back into the tank?

Mr. Battin—Yes, sir.

Mr. Robb—How often do you check up the oil meter?

Mr. Battin—We do not check it at all. We are using a hot water meter and find it runs very constant. About the only time we take them out is when we rechecker the machine. We then take them out, clean and test them. They seem to run quite constant. We don't make any check of them until we clean them out. With regard to the use of photometers in the works. That, of course, is a very nice thing, but they are expensive, and I got up this paper to cover, more especially, smaller works. The method I used was this: I had a gas jet burning in a little box covered with glass, the gas being supplied from the main supplying the town. In the box at the side of the flame was a jet burning, gas being pumped from the relief holder and purifiers into the holder. The relative candle power shows up very plainly side by side, and the gas maker, by the difference between the two, can tell whether he is getting oil enough in or not. As to changing the spacing of the checkerbrick. I know in one instance we changed the checkerbrick from 2½ inches to 3 inches through the whole machine and the machine acted very differently—made more gas and better gas; but we were all sure it was due to something els, the fuel or something

of that kind. Then we changed back to 2½ inches and the machine went back again. It is hard to explain. Likewise in the carburetter we have used all methods of checkering. When my father first taught me checkering we would take each brick and chip it off so it would fit the circle of the machine. In fact, we used a shoemaker's measuring device to gauge the brick and get them all of the same height before we put them in. After that we tried various methods of checkering, including the making of a cone of the carburetter checkerbrick, making them the full area of the carburetter at the bottom and tapering back as we came up, leaving a space of 6 inches between the checkerbrick and the wall at the top. Now, we tried all these things but always came back to the practice of making a uniform spacing all through. Of course, the size and proportions of the machine are most important. If you have a machine that does not have brick enough in and blasts very freely you can checker it down to as close as 1½ inches. With regard to the 7-minute blasts and the 5-minute run and the question of changing it. Undoubtedly that must be a machine in which some one of the conditions I first started out to enumerate is wrong. There is either not blast pressure enough or too much resistance to the blast, or else the heats never get very high through the short time the machine is run each day. On the other hand, where you are making gas only a few hours per day you may be better off to run lower heats at the start than otherwise. While high heats would be the right thing if you were going to run through the day, still if you are only making gas a few hours each day, you can carry the heats lower and use less fuel than by the other method. Of course, every machine has its peculiarities and each machine must be tried out according to the different possible changes, making one at a time and giving plenty of time to try each change and be sure you are right before you make another change. The matter of the amount of fuel used depends on the size of the machine. A very small one should not run more than 40 or 45 pounds, whereas on a big machine you could get down to 35 pounds. Of course, that is with gas house coke; with oven coke it will be lower. I would screen all small stuff out of the coal. We do it. Using breeze around the outside of the machine is done by some of our men, but it is practicable only in those machines where the coaling is done through the top of the generator. It would be impossible to do it where you have to shovel in the side of the machine, and there are so many machines of that type that such plans as using breeze, limestone or oyster shells do not pay. I know breeze does keep the clinkers off if you distribute it around the outer edge of the generator. As to the circulation of water in the holder tank with a pump. Ofttimes you can circulate your water without a pump at all if you have a tank which is higher than the condenser by simply piping the condenser up to the tank like a water heater. That is done in a good many works. [Mr. Battin here made a sketch on a large sheet of paper of the dumping grate used in Chicago. The following sketch shows how this grate is constructed. It also


IN MIDDLE OF GRATE ARE THREE LONG STRAIGHT DOORS WHICH DO NOT DUMP
ONE DUMPING GRATE AT EACH DOOR
BLAST INLET
THROUGH THESE SQUARE HOLES STEAM AND AIR ARE EVENLY DISTRIBUTED OVER WHOLE GRATE, THROUGH BLAST BARS.

DUMPING GRATE

shows how the steam and air enter the machine under the hollow blast bars and are distributed evenly by these bars.] Some of our superintendents think these blast bars a great thing for the distribution of the steam, but personally I do not hold them of any advantage in that respect, for you can bring the steam in through the pipe, turn down your "L," and get as good distribution as you need.

Mr. Rhoades—Would you turn the "L" down or up?

Mr. Battin—Down.

Mr. Robb—How would you handle the ashes that drop down on the bars?

Mr. Battin—The ashes which fall through the grate bars are simply on the flat bottom of the ashpans and are taken out with a scoop shovel, or raked out with a long-handled hoe through the cleaning doors. When we break our clinkers up with big bars we get them on the average 400 pounds in weight—some are 600 to 650 pounds. Imagine the saving in time and hard work this made! Instead of punching the clinkers up with a bar we break them in big chunks, and they slide down of their own weight, so instead of there being a greater loss of fuel through this dumping grate it is almost done away with, because it is not the pulling out of the clinkers, but rather the shaking up of the fire when breaking up the clinkers, that loosens up the fire. When you put this bar in you simply break up the clinkers into large lumps and pull them out. You can then pull up the grate bar and have all your fire left in the machine. Even in the smallest machines we use this dumping grate—it was gotten up at our Division street works and is not patented—the repairs are practically no more than the cost of straightening out ordinary straight bars when they become warped. The thin, brownish tar Mr. Robb spoke about you always get with certain oils. You cannot do away with it in Beaumont oil and get as black a tar as you will get when using other oils—for instance, Ohio or Pennsylvania oils. In that case you have to do the best you can with the brownish tar and dispose of it to the best advantage. Where you are using the oil we in Illinois use generally—that was what I was speaking of—a brownish color is almost always a sign of low heat or bad fire. Low heats cause light tar to be formed, whereas the heats should be so as to just bring the gas to the point of depositing lampblack on the brick. [Loud and long continued applause.]

Mr. Rice—I move a vote of thanks to Mr. Battin for his valuable paper. [Seconded and carried unanimously by a rising vote.]

On motion, the convention adjourned.

[Communicated Article.]

Instances of Schoolroom Lighting.

By Mr. J. F. W. Jost.

The excellent article on "Some Instances of Schoolroom Lighting," by Mr. N. W. Gifford, of New Bedford, Mass., which was printed in the Journal for April 1st, as also certain instances that preceded it in which the observer was handicapped by lack of a proper standard, was the evident cause of an editorial in a recent issue of *Engineering Record*, that article presenting a plea made for some method of quantitative measurement of illumination.

The Illuminating Engineering Society has been in existence some months, and many papers have been read, yet all this has been done without the adoption of a standard of measurement, which led Mr. N. W. Gifford to modestly state, referring to some of his measurements, "The values of which are not known to the writer." However, he is no worse off than the rest, because up to now there has been no unit in which to express the values.

This seems to be because the Society has busied itself with measurement of sources of light which led Mr. Elliot to remark, in his paper read before it, that "*Producing light* is one thing and getting good *illumination* quite another." The editorial in question also remarks that, "The Engineering side of illumination concerns itself with making the best possible use of the means at hand." This brings us down to the question, "Does the efficiency of the source concern the illuminating engineer primarily, rather than the efficiency of the use which he makes of it?'

Cannot the Illuminating Engineering Society, therefore, set a standard in which to express the commodity in which it is dealing so that comparisons may be made, and those of us who read its papers can hear the "talk in numbers." Let them set a standard in this unit which should be the minimum for certain classes of work, entirely apart from the source, and not make us guess at "concentrated," "direct," "reflected" and "indirect," from a numberless variety of sources.

Without wishing to appear captious it seems an unfortunate commentary on scientific methods that the suggestion and plea for a unit to work on should come from an outside source, however respected that source may be.

The field which is of so much importance, and which has been gone into so little in this country, is the determination of the amount of illumination required for different classes of work; for example, the school room, the drafting room, the shop, etc., so that in any given example a measurement can be taken and the question at once be determined whether the illumination is sufficient, and in laying out new installations a guide to what will be adequate. In this way the Society could fill a sphere of usefulness which would be a great help to the gas man.

I realize that in writing this I lay myself open to the charge of unwarrantable criticism, but I trust anyone so disposed will forgive me my humble effort "for the good of the cause."

[Communicated by "R."]

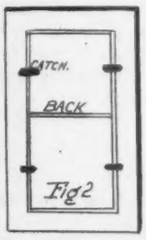
Blue Print Frame in the Gas Engineering Shop.

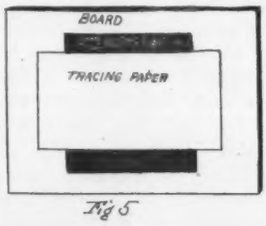
The mechanical department of the gas manufacturing and distributing industry is more or less concerned with blue printing. Certain sketches are to be produced in duplicate, diagrams of gas plants and pipe installations to be printed in manifold form, and various other reasons for the employment of the blue printing frame. This article will treat of a simple device which is of great convenience in any mechanical work for executing plans and various impressions of work for builders and contractors. Often people like to see a blue print diagram of the installation of lighting apparatus to be placed in their building, and alterations in systems, additions, etc., can be set forth

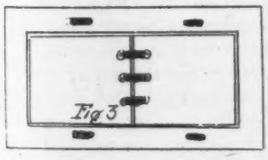
quite plainly with the blue print. The attached drawings are given with the idea of presenting methods for making and using the blue printing frame. Taking it for granted that you will have to make the frame, get some moderately hard wood and have it cut and planed to 3 inches in width and a little more than 1 inch in thickness. Cut these strips into pieces so as to form a frame 3 feet long and about 2 feet wide, according to the dimensions of the work you are calculating to manipulate. The frame can be jointed by lapping or by dovetailing the corners, so as to get the result exhibited in Fig. 1. After the frame is set up, arrangements should be made for the putting in of a backing, as in Fig. 2. The backing may consist of some thin wood, cut so that the 2 halves will fit into the back of the frame, as shown.

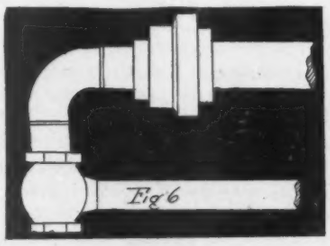
The halves should be joined in the center with hinges or loops, so that one side may be elevated at will, to examine the work below, without disturbing the other side. In order that the backing may be retained securely in place in the frame, when closed, you can use the catches or swivels. These are made of wood and are screwed with a single screw to the frame, at points near the halves, so that when turned across they will hold down the halves.

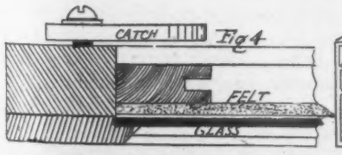
The section of the set up of the frame is exhibited in Fig. 4. The mode of joining the corners is also shown in that cut. Beginning at the lower side or front, we see that the black portion represents glass, this glass being supported in the frame by cleats. Plate glass is the best to use, although the common window variety will satisfactorily fill the requirements, but as they will not be so strong they may crack under pressure. Then you require a thickness of felt, which is placed on the galls, then the backing goes on, the catches are sprung and the frame is complete.

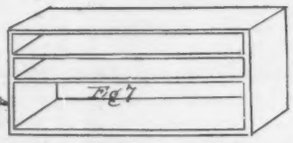












Now, then, the operation of the frame requires some study. Certain chemical salts possess the property of changing color when exposed to sunlight. In fact, the principle of photography is applied in the blue printing process. Thin solutions of gelatine can be impregnated with ferro-prussiate of potash and exposed to the light under such conditions that the material becomes insoluble in water. However, as you can get the blue printing paper from the dealers all in readiness for use a detailed explanation is hardly necessary. The blue-print paper is properly coated with the ferro-prusssiate of potash before you get it. The solution of gelatine is applied to the surfacing of the blue printing paper while the paper is in a dark room. The surface is carefully dried and the paper is placed away from the light. Thus prepared, the paper is in readiness for use.

Next, you need a sketching board. You can use the top of any table, desk or box, but it is best to be properly equipped with devices. With your sketching board and devices before you, proceed as in Fig. 5. Here is shown the base board, which may be of common pine stock, constructed about 3 feet square, and the tracing paper on the blue-print. The original drawing of the system of piping or the gas plant installation is made on common drawing paper. This sketching you place on the board and with the thumb tacks secure it evenly. The tracing paper goes on next. The darkened portion in this cut represents the paper on which the first drawing is made. The tracing paper on this original drawing can be handled with ease, providing that it is properly secured with the sketching board tacks. Then make your tracing. Use a common ruling pen and India ink, so as to get the lines full and black. After the tracing paper is in completed form, remove it and have it ready for application in your frame (the frame is placed on a convenient stand), but you first put in the glass.

The blue-print is now placed on the glass and the felt cover backing is smoothly adjusted on the same. After assuring yourself that no wrinkles prevail, clap down both sides of the wood back, and fasten with the cleats or catches. The whole thing is now secure.

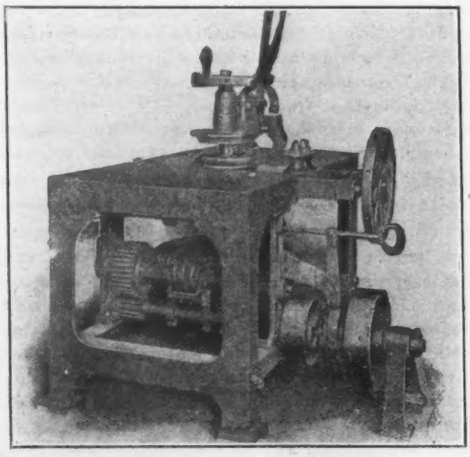
Next comes the exposure to the light, the principle of which is this: The tracing paper is, of course, thin and light. Its transparency permits the penetration of the light to the surface of the blue print below, with the result that the light alters the color of the blue print surface, except at points where protection from the penetrating light may exist. The lines made on the tracing paper, in jet black ink, form the required shade and protection for the part to shape the diagram.

The gelatine coating, which is under the open or clear parts of the tracing, becomes changed by the light so that the coating will not dissolve. The opposite action prevails in the parts shaded by the lines of the drawing, and the familiar white lines of the blue print come to light. Next, you do a little saturating in plain water. Then the white lines come up in full and you have the blue print ready to use. You can strike off 1 copy or 100. Work of the nature shown in Fig. 6 is used a great deal. To file the prints, after drying them off, use a case made of an old empty box and shelves, as in Fig. 7.

Stoever's Pipe Bending Machine.

Any contracting engineer who has to adjust piping for the equipment of the apparatus he installs frequently finds that great advantage would attend the use of bends in the pipe over the use of the fittings that are available. In every large center some one has made a specialty of bending pipes, but methods used have been expensive, and in most instances require considerable time. This condition has been the incentive for the production of the pipe bending machine shown in the accompanying illustration by the Stoever Foundry and Manufacturing Company. The machine is made substantial and well calculated to stand the severe strains put upon it in bending pipe from 1 to 2½-inch in diameter on a radius of 2½ to 12 inches, either hot or cold.

As shown in the illustration provision is made to avoid the possibility



of kinking in the pipe, and all bends are made just alike. Some idea of the capacity of the machine can be gained from the statement by the Company that 309 bends of 2-inch pipe on a 4-inch radius have been made in 9 hours. The machine is designed to be run by power. A wheel on the right side adjusts rollers to the sweep of the bend to be made. These are grooved to fit the pipe and run loose on proper supports, so that when the pipe is being bent they will revolve and reduce the friction. When the rolls and the disks are arranged at the proper radius powerful jaws clamp the pipe, and the machine is started in operation and will be stopped automatically as soon as the pipe has been bent to the proper shape. The strong features of the machine are

that the pipe is bent quickly and without deforming it, and that when the machine is set for a certain angle of bend, all bends made with that setting will be exactly alike, as stated. The machine may be set to bend any angle up to 180°.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Mr. A. D. Mackie Explains His Remarks Respecting the Matter of a "Close Second."

PEORIA GAS AND ELECTRIC COMPANY,
PEORIA, ILLS., April 25, 1907.

Your criticism of my humble address, delivered in good faith at the meeting of the Illinois Gas Association in Peoria recently, pleases me because it opens up the subject for discussion.

My paper was on "New Business Methods." After stating that you consider the paper to have been a good one, you take exception to the opening paragraph, which is as follows:

"It was only a few years ago that the gas manager devoted the greater portion of his time and energy to the manufacturing end of the gas business. Matters pertaining to the installation of apparatus for the taking away of the 'spirit of the coal,' and the different processes to which it is subjected before it reaches the distribution arteries, were to him of paramount importance. But he is now awakening to the fact that it is not so much to the man who makes the goods as to the man who sells them, he must look for the doughnuts; not the manufacturing engineer but the commercial engineer is the man behind the gun, and the man to whom he must look for the dividends. And in saying this I speak advisedly and with hearty appreciation of the man at the retorts; for without him to produce a good, first-class article, there would be very little use for the commercial man. Indeed, I will give the manufacturing engineer credit for being a very close second, and almost as important an adjunct to the gas world as the commercial engineer."

I also copy your criticism, which to me seems entirely foreign to the argument:

"Enthusiasm accounts in a way for much, and emotionalism counts for more, but neither is a safe guide; in fact, youth in time discovers this, often to its sorrow. It is true, one in the exuberance of youthful force discovers new things, but it is further sadly true that in the vortex of the discovery are many raging gulfs, and sadder still, then it is that the youthful discoverer's bark is wrecked. The discovery, however, goes on to development, and the developers are the older ones, who were (as it were) quite a while on the job of keeping the old craft safely afloat. No; it cannot be otherwise. Before you have anything to sell, that thing must have been found or have been made, and we would like to have shown to us when or where it was that the agent was superior to the creator, from any point of view. That sight has not been seen to now, in which view we will have to submit the statement that the engineer must lead the procession that mutually strives for the going on of the general good, even as the horse's labor is to 'move the cart,' whether that noble animal is between the shafts, or is attempting to push the vehicle along."

Now, if you will sit up and take notice, you will find that there is nothing in the argument which should license you to believe that I am assuming that any agent could be superior to the creator of a thing. My point was simply and only, that the commercial representative, the man who sells any commodity, is the real man behind the gun, the man upon whom the stockholders in any corporation must really depend for the dividends, which they so eagerly seek; that this man is really of more value than the engineer or the man with the shovel or the hoe, will be conceded by any man who understands modern commercial methods.

Of what use is it to make gas, if there be not first a demand for it, and who creates this demand, the mechanical engineer or the commercial engineer? "Necessity is the mother of invention," but the man who is capable of making people understand what is a necessity, is more valuable than the man who afterward supplies the necessity. The salesman is the pioneer; he blazes the way for the man who runs the machines that manufacture the commodity the salesman has sold, and it does not matter whether the commodity be gold bricks or gas. All of which I humbly but respectfully submit.

Yours very truly, ARTHUR D. MACKIE.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES

MR. WILLIAM S. BARKER, recently appointed Vice-President and General Superintendent of the Denver (Col.) Gas and Electric Company, will retain the Presidency of the Northern Colorado Power Company.

MR. JOSEPH SUMMERS WOOD, who was prominent in the early development of the Pintsch system of illumination for passenger coaches on railways, died at his home, Brooklyn, N. Y., the 28th ult. He was in his 74th year, having been born in New York city, July 18, 1833.

LAST February Mr. E. H. Yorke, of the Portland (Me.) Gas Light Company, communicated to the New England Association of Gas Engineers a set of rules for the assembling and manning of apparatus for the preventing or extinguishing of fires in gas works. The paper unfortunately through the illness of Mr. Yorke, who was thus unable to attend the sessions, was not discussed, but the tabulations were taken home by many of the delegates to study at their leisure. On the 22d ult. Mr. Yorke's fire system had a thorough trial because of a fire that broke out in the delivery shed of the Maine Central Railroad, at the foot of York street, Portland. The Portland *Express*, in giving an account of the fire, had this to say about the gas works fire corps: "Too much credit cannot be given Superintendent E. H. Yorke, of the Portland Gas Company, for his promptness in ordering out the well disciplined department which is maintained at the gas works. The stretching of two lines of hose by the employees of the Company and the quickness with which water was turned upon the flames undoubtedly helped the fire department men a great deal."

A CORRESPONDENT in Chicago incloses the following: "The Citizens Gas Company, of Kankakee, Ills., formerly owned and operated by Street, Wykes & Co., of New York, has been taken over by a party of Chicago financiers. Mr. Newbury remains in charge as Superintendent. The following Directors and officers were chosen to manage its affairs: Edward G. Pratt, Howard Green, C. C. Smith, Ludington Patton and F. N. Boyer, Directors. President, C. C. Smith; Vice-President and General Manager, E. G. Pratt; Secretary and Treasurer, Howard Green. In speaking of the policy of the new Company, Colonel Pratt said: 'Our capital stock which was at $150,000 originally will remain the same for the present. It is our intention to place the works in first class condition; we intend to extend our mains and place gas where everyone may use it.' When asked regarding the reduction of the present price of gas, Mr. Pratt said: 'As to that we are not in a position to state, but you may draw your own inference when I tell you that we aim to place the price of gas and the facilities for obtaining it within the reach of all. No, we shall not enlarge the present plant as the capacity at present is large enough to more than meet all demands. We intend to establish larger and better offices in your city though and display to the people the several different uses of our commodity.'"

AT the annual meeting of the Northwestern Gas and Electric Company, of Walla Walla, Wash., the officers chosen were: President, I. W. Anderson; Vice-President, C. M. Rader; Secretary and Treasurer, Otto B. Frank.

MR. H. REID has resigned from the service of the Johnstown and Gloversville (N. Y.) Gas Company to accept a place on the works' force of the Tampa (Fla.) Gas Company,

MR. E. HOWARD CORBETT has resigned his position as Eastern representative of the Western Gas Construction Company, in order to assume the duties of Chief Engineer of the gas and refrigeration department of the Hallidie Machinery Company, of Washington. This Company is the largest machinery house in the Northwest, who in addition to being a general machinery agent, is an engineer and contractor for complete plants. Mr. Corbett will also act as agent for the Brown rotary meter, the Gas Machinery Company's complete apparatus, the Terry Steam Turbine Company, of Hartford, Conn., the Industrial Oxygen Company, of New York, the Triumph Ice Machine Company, of Cincinnati, the Jacobson Producer Gas Engine, and the Automatic Machine Company, of Bridgeport. The last named concern manufactures a full line of heavy marine engines, for use with either gasoline or distillates. He will also represent the leading manufacturers of bituminous gas producers. He took his way to the Coast last Wednesday, and along with him went the heartiest good wishes of a host of friends.

A RECENT issue of the New Orleans *Harlequin* had this to say—its caption was "Tom's Hot Air." "Here's one on the immortal 'Tom.,' master diplomat of the world. "Giff." wanted me to father it; but Tom is too big:

"I came home for a late supper and found the Madam rather impatient, as I had forgotten to mention my wishes for the evening *menu.* In order to smooth things over I said 'That's easy; prepare some toast and we'll have some *paté de foie gras;* then you can warm up the ragout of mutton left from this noon, a little bread and cheese, strawberries, a glass of claret, and your supper is fixed. She took kindly to the suggestion. I made myself comfortable, lit a pipe and whiled away the time reading, while the Madam got things ready. Lying in gentle repose upon my couch, I had gone in for quite a speculation upon the future success of the *Morning World,* when I was disturbed by a rattling of pots and pans mixed with the sweetest of feminine French expressions. Startled, I inquired as to the cause of the trouble, when the Madam rushed in and poured out the following: 'Well, all right! You wanted gas! Come and see! It is nothing but air and no gas!' 'You said gas was better than coal.' '*Bien,* we put the gas, it blows, but gives no fire!' 'You said the Gas Company is managed by your friend Millair. He is all right!' '*Bien,* Mistair Millair may be all right, but his gas is not!' 'Some months past I paied the gas bill and viewed in the Company's window a toaster. I said to myself, Mistair Millair is all right! The toaster must be all right!' '*Eh, bien,* toaster is no good and gas is no good! It's all *air!* Bread dries, but no toast, because gas not burps—it is all air! I open the gas, put the match to it, and gas say, *Putch-ch-ch-ch!* and *pam!* and air comes out and no toast. Your Mistair Millair and gas—it is all *Putch-ch-ch-ch!* and *pam* and no heat!' I did my best to calm the Madam's nerves by telling her that I would go to the Company's offices the next day in order to have it fixed, but she demurred and wanted it fixed at once. I tried to explain to her that it was after office hours and that everybody had gone home. She cut me short and said: 'Gone! Gone! Maybe; but the hot air is left!'"

THE New Haven (Conn.) Gas Company will have completed its main extension to Branford by June 15th.

AT the annual meeting of the Denver (Col.) Gas and Electric Company, which is to be held the 14th inst., it is not thought that any change will be made in the executive management.

A GAS plant is to be built forthwith at Beardstown, Ills. The contract for the same has been awarded to Mr. George F. Goodnow, of Chicago.

AT the annual meeting of the Columbus (O.) Gas and Fuel Company, Mr. H. D. Tierney was elected President, vice the late Mr. J. D. Johnston, and Mr. E. K. Stewart was elected Vice-President. The earnings for the year ended April 1st last exceeded those for the corresponding period of 1906 in the sum of $60,000.

THE plant of the Cambridge (Md.) Company was recently purchased by residents of this city, the reported price being turned in at $40,000.

THE actual transfer of the stock of the Woonsocket (R. I.) Electric Machine & Power Company to the Holden syndicate, which owns *in toto* the Woonsocket Gas and Electric Company, has been accomplished.

THE Economy Light, Fuel & Power Company, of Lockport, N. Y., has applied to the State Commission of Gas and Electricity, for consent to issue $185,000 bonds, to run 30 years, and to bear 5 per cent. interest.

THE United Gas Improvement Company has been awarded the contract for 2 sets of its double-superheater, standard water gas apparatus to be placed in the generating division of the Danbury and Bethel Gas and Electric Light Company's system in Danbury, Conn. The total daily capacity of the sets is 800,000 cubic feet. This contract is the more noteworthy from the fact that the new sets are to replace an Edgerton water gas apparatus that has been in use in Danbury these many, many, years.

THE offices of the Menominee (Wis.) Gas Company are to be removed to suitable quarters in the premises one door north of their present location. The Company gains in output right along.

A CORRESPONDENT in Boston incloses the following: "The office and engineering forces of the North Adams (Mass.) Gas and Electric Company were entertained at a banquet given in the Wilson Hotel some evenings ago, the hosts being Messrs. W. Hunter and F. E. Briggs, who thus saw fit to entertain their friends on the occasion of the day which marked another figure in their natal history. Guests to the number of 23 responded to the invitations. After an excellent repast had been set up and put down, the cloth was removed, cigars were served, and order was called by Mr. F. E. Curtis, who made a most suave and diplomatic toastmaster. The speakers included the Hon. H. T. Cady, Col. F. S. Richardson and Mr. S. Proctor Thayer; and they talked well—particularly the Colonel, whose speech was as bright and glowing as was the pink in his coat. Before the hosts were thanked, Mr. James C. Turner, on behalf of the employees of the Company, presented each of the hosts with an up-to-date silk umbrella. The presentation moved his Honor to remark that the tokens were appropriate, in that each of the recipients well knew how to keep dry on rainy days—to say nothing of the nights."

AT the special town meeting held to vote upon the question, the ratepayers of Southington, Conn., accepted the proposition for the laying on of gas to the town that was submitted by the Meriden Company.

UNDER the terms of the franchise granted to Mr. Charles R. Lane for the right to supply gas in Danville, Ind., the rate is not to exceed $1.35 per 1,000. Construction work is to be commenced within 12 months and the supply must be laid on within 24 months.

THE dead body of Mr. Robert J. Macy, the clerk who had been missing from his desk in the office of the Portland (Me.) Gas Light Company since the 10th ult., was discovered the last day of April in a clump of woods in the suburb of Portland known as Allen's Corner. The case was evidently one of suicide.

THIS was sent us from Indianapolis, Ind., under date of the 28th ult: "All of this talk about hard times and 90 cent gas is child's prattle," remarked the oldest inhabitant feebly shaking his white head, and speaking in a thin piping voice. "Why, I remember the day when gas was $4.50 per 1,000 cubic feet right here in Indianapolis, and I have the proof of it in the bureau yonder. The old man rose, and, leaning heavily on his cane, hobbled over to a piece of fine old mahogany furniture, from the top drawer of which he pulled out a little old iron chest. Hobbling back to his chair, he opened this chest, and from its depths pulled out a bunch of old receipts held together by a bent and rusty pin. With his trembling fingers he turned the receipts one by one, until he came to one about the size of a dollar bill, whose most conspicuous lettering was 'To the Indianapolis Gas Light and Coke Company.' The bill was presented March 1, 1865, and was for gas consumed in the month ending February 28, 1865. The bill was for $1.35 at the rate of $4.50 per 1,000 feet. The bill as originally printed was for $3.75 per 1,000 feet, but gas had evidently taken a rise. 'L. Van Laningham' had receipted for the $1.35. 'In those days,' remarked the old man with a touch of cynicism in his voice, 'they showed you how to read your meter.' He turned the receipt over. 'Here,' he said, pointing to three dials pictured on the back, 'are complete instructions for reading it. We always kept these bills and knew before the inspector came round how much we would have to pay for our month's consumption."

The Milwaukee, Wis., *Free Press* reports that "Independent verifications of meters and the locating of candle power testing room in the outlying districts is recommended by A. S. Mitchell, who resigned as gas inspector to take charge of the governmental pure food station at St. Paul, Minn. The recommendations are made in a brief report of what has been accomplished that has been submitted to Mayor Becker. Mr. Mitchell says he believes the supervision of gas supply has resulted in greater uniformity and some improvement in quality and pressure. He says: 'Examination of meters for accuracy of measurement and registration has so far been done only through courtesy of the Milwaukee Gas Light Company. In the future it is desirable to provide for the independent verification of meters where complaints are made and upon the payment of a nominal fee covering the cost of such inspection. I do not feel that the demand in this regard warrants the expenditure involved in the testing and certification of all meters now in use. It is also desirable to locate candle power testing rooms in the outlying districts of the several parts of the city where daily tests can be made and uniform distribution guaranteed. Analyzing the results that have been obtained by gas supervision, it will be seen that the gas, while subject to variation, generally meets all standards required with the single exception of a slight deficiency in heating power. In this particular some improvement has been made and more should follow. In this connection it is but fair to say that the Milwaukee Gas Light Company has at all times shown a disposition to promptly correct such faults and pressure as were brought to its attention.'"

THE AMERICAN GAS LIGHT JOURNAL

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NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, MAY 6, 1907.

The Market for Gas Securities.

Steadiness and strength dominatad the market for city gas shares last week. The quotations for Brooklyn Union are much better than those reported for weeks back, the stock selling up to 125 last Wednesday. The sharp upward movement in Brooklyn Union was traceable to the decision by the Court of Appeals in the case of the Company against the City of New York, which case has been dragging along for months. To sum up the finding, it is held that the city cannot question the lawfulness of the price charged for gas furnished and consumed by it on the mere contention that the price is in excess of the fair and reasonable value.

Peoples, of Chicago, is 62¼ to 63; Massachusetts shows no change, and Cincinnati is dull, the price, however, being well maintained.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

MAY 6.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	133¼	135½
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	3,000,000	1,000	101	104
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	..	105
Mutual	3,500,000	100	190	225
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000 000	1,000	98	100
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p.ct.	1,000,000	..	98	104
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	101	103
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	108	111
Con. 5's, due 1945, J. & J.	1,530,000	..	104	110
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
1st Mtg. 5's, due 1930, M. & N	1,500,000	1,000	104	108
The Brooklyn Union	15,000,000	1,000	118	125
1st Con. 5's, due 1948, M. & N	15,000,000		107	..
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Bay State	50,000,000	50	¼	⅜
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	509,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	9	10
" " Bonds, 5's	5,250,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,550,000	1,000	104	106¾
Cincinnati Gas and Electric Co.	29,500,000	100	98½	99
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	..
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	87	88
Preferred	3,095,500	100	107½	108
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	.	90
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	980,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co	5,000,000	50	..	50
" Prior Lien 5's	4,618,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
Bonds, 5's	10,500,000	..	107½	108½
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	220,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	03
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	104	104¼
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	250,000	1,000	108	108¾
" 6 per cent. scrip, due 1910	100,000	25	85	87
Massachusetts Gas Companies of Boston	25,000,000	100	62¾	63
Preferred	25,000,000	100	85½	85¾
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	6,000,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	92¾	93
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
" 2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	104½	105¼
San Francisco, Cal.	15,800,000	100	..	..
St. Joseph Gas Co. 1st Mtg. 5's	751,000	1,000	92	..
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	113½	115
General Mortgage, 5's	2,465,000	1,000	96¼	..
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	..
Washington, D. C	2,500,000	20	300	305
First mortgage 5's	600,000	..	..	..
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del.	600,000	50	230	..

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PRACTICAL LECTURER
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A Capable Manager and Superintendent,

Now employed, desires a position as manager or superintendent of gas, or combined gas and electric plants, in city of 15,000 to 25,000 population. Successful record. Southern or Middle States location preferred.
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By young married man of 16 years' experience in all its branches. Is now superintendent of gas company of 30,000,000 cubic feet. Will have to give present company 60 days' notice. Best of references.
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Position as Manager or Superintendent of medium sized gas company, or as head of distribution or street department of a large works. At present superintendent of distribution of a concern with 400 miles of main and a daily sendout of 6,000,000. Best of references and good reasons for wishing a change.
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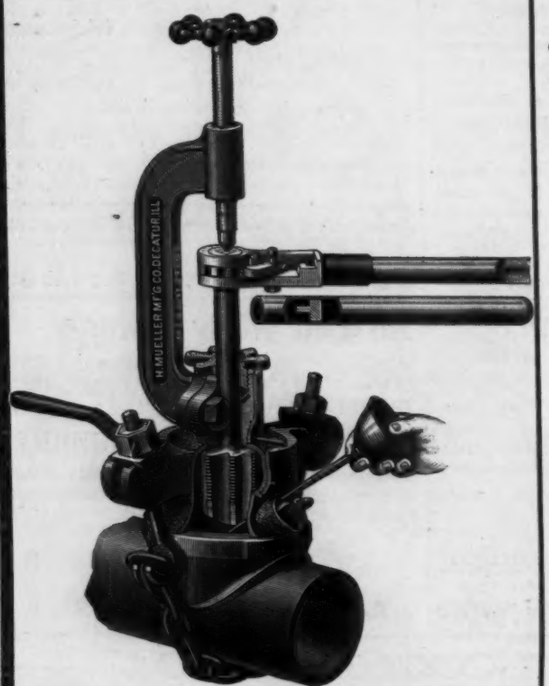

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If you have no use for a tapping machine you don't need one. But if you have use for one you certainly need a MUELLER MACHINE.

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They are solidly built and do the work fast and clean cut.

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The 4,000,000 Cubic Foot Per Day

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FOR THE

CONSOLIDATED GAS COMPANY OF NEW YORK.

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One-half the Cost—One-tenth the Space.

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EXHAUSTERS, CONDENSERS, SCRUBBERS,
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BY PRODUCT MACHINERY,
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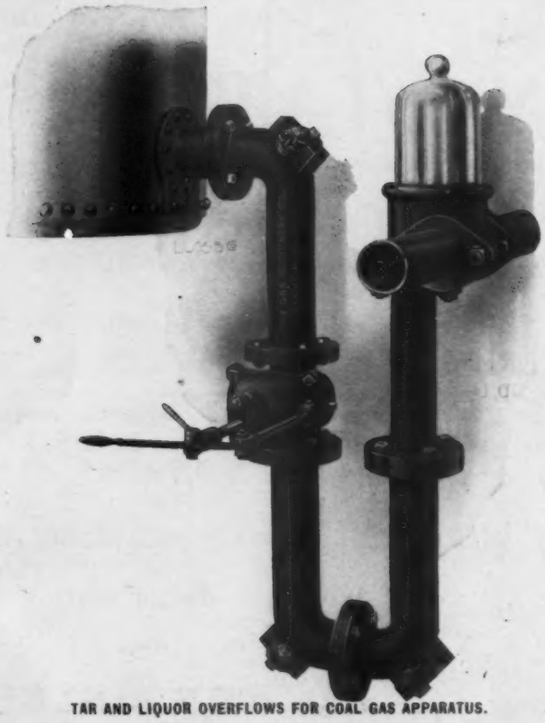

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GAS RETORTS AND FIREBRICK.

We Manufacture Gas Retorts and Settings, Furnace Blocks and Fireclay Tiles of every description.

FIDDES-ALDRIDGE SIMULTANEOUS RETORT DISCHARGING-CHARGER
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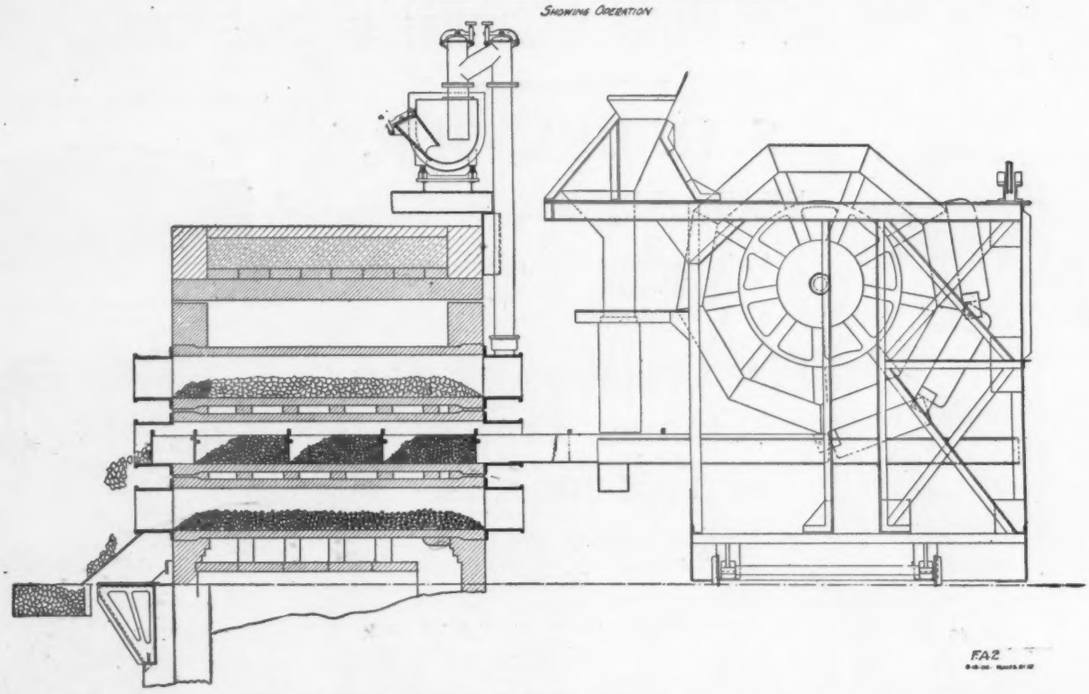

Benches.--We erect GAS RETORT BENCHES with Horizontal retorts having closed ends up to 10 feet in length, or Through retorts up to 20 feet in length.

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ALL CONTRACTS MADE, AS OF ST. LOUIS.

Bray's Union-Jet.

ASK ANY GAS COMPANY WHO USES BRAY BURNERS WHY THEY USE THEM,

And their answers would contain more reasons than would fill this page. Reduced to a few words it would be—

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Could you ask for better reasons?

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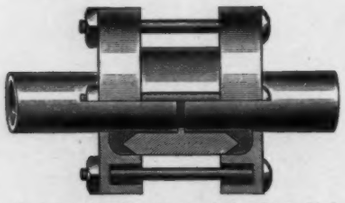
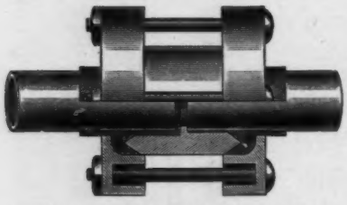
We make Gas Appliances of all kinds. SOLE AGENTS for BRAY BURNERS for the UNITED STATES and CANADA.

Self-Lighting Burner.


Regular Coupling, Style 1, for Plain End Wrought Iron Pipe.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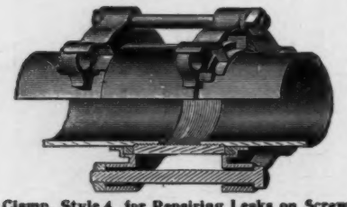
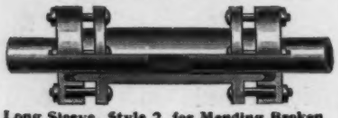

Clamp, Style 4, for Repairing Leaks on Screw Collar.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Pipe Couplings, Sleeves, Clamps, Crosses, Tees and Ells.

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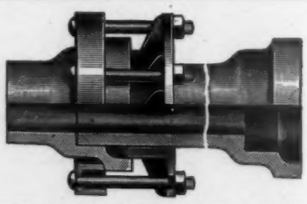
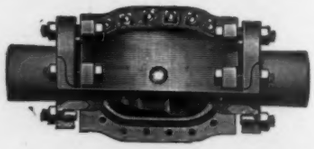
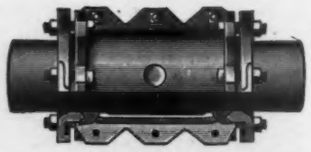
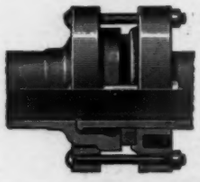
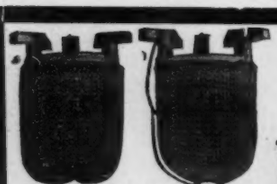

Coupling, Style 9, for Special Style Cast Iron Pipe.


Split Sleeve for Repairing Broken Bell on Cast Iron Pipe.


Split Sleeve for Repairing Broken or Cracked Cast Iron Pipe.


Clamp, Style 4½, for Repairing Leaky Lead or Cement Joints in Cast Iron Pipe.


No. 1 Plain. No. 1 Wired. For No. 1, 2, 4 and 5 Lamps.

Bijou. Bijou Wired. For No. 3 (Bijou) Lamp.

"Rico" Mantles.

Ramsdell

Our Mantles are the Standard Inverted Mantles, just as the RAMSDELL is the Standard Inverted Lamp. They are manufactured especially for the Ramsdell Lamps, being made of double woven Ramie and bearing our Trade Mark "RICO." Being made on our patented Mantle Ring, a firm hold is obtained on the porcelain cone, which prevents the mantle being jarred off the holder. This is an important feature of the "Rico" Mantles, and is one of the points which makes them the best mantles produced.

We have the exclusive control for the United States and Canada of the Farkas patents, covering the WIRE CAGED MANTLES such as are used abroad for Railway Car Lighting. This Mantle has been extensively used by us in the past two years on the Ramsdell Inverted Arcs and on other lamps where they are subjected to unusually severe requirements.

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H. M. BYLLESBY & COMPANY

(INCORPORATED)

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DESIGN, CONSTRUCT AND OPERATE
COMPLETE COAL, WATER AND CRUDE OIL GAS PLANTS.

HIGH AND LOW PRESSURE DISTRIBUTING SYSTEMS.

EXAMINATIONS AND REPORTS.

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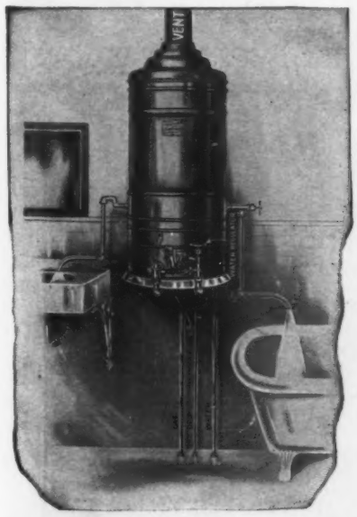

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will supply hot water for any purpose more easily, quickly and cheaply than any other arrangement. Finest material and workmanship. Most handsome design. Highest efficiency. Larger number in use than of all other makes combined. *Absolutely Guaranteed.*

Send us your Orders. We will Help you Make Sales.

GUARANTEE.

We guarantee the efficiency and workmanship of these heaters in every detail. We will replace free of charge any part proving defective.

Have you seen our handsome New Catalog No. 9? IT'S FREE.

No. Heater.	Price.	Gas Supply from Meter.	Heats Gals. per Min. 30° in Temperature.	Height Inches.	Diameter Inches.	Shipping Weight.
2	$40.00	¾ Inch.	2¼	34⅝	12	70 Pounds.
10	52.00	¾ "	2⅞	36	12	90 "
6	29.00	¾ "	3	29¼	12	60 "
8	23.50	½ "	2⅜	28½	10¼	48 "

These prices include Safety Valves and Unions, one Bent Outlet Spout, but no extra fittings.

A white porcelain enameled steel shelf and nickel plated bracket are supplied with each heater.

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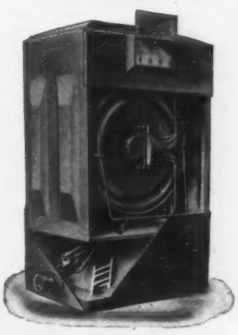
NO DUMPING OF METERS TO GET THE WATER OUT.

Permits Water and other liquids of condensation in House Service Pipes to flow back through Service Pipe to Mains by Natural Gravity.

Prevents Danger of Accidental Asphyxiation.



PATENTED MAY 13, 1902.

Capacity Increased, Loss of Pressure Decreased, as larger Stroke, Valves and Channels Give Freer Passage.

Insures Steady Light, No Flickering Possible.

Impossible for Condensation to Reach Diaphragm or Diaphragm Chamber. Valves on an incline prevent clogging up.

Saves Over 75 Per Cent. in Cost Annual Repairs.

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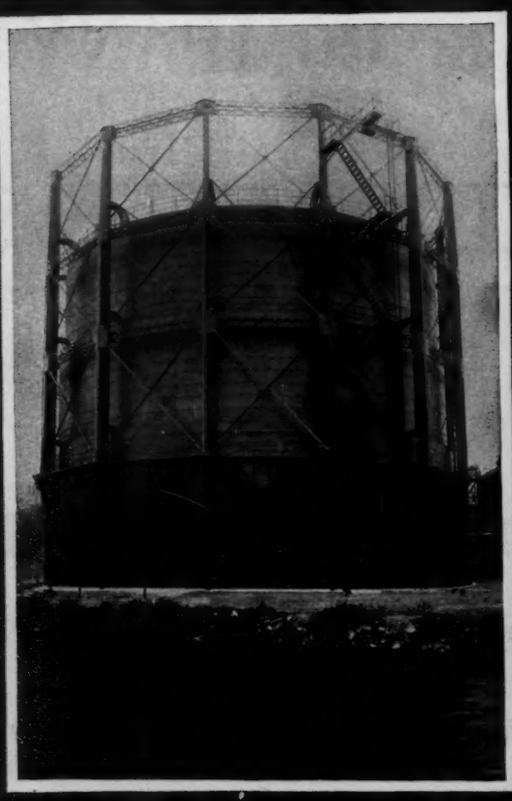

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ROTARY AMMONIA SCRUBBERS

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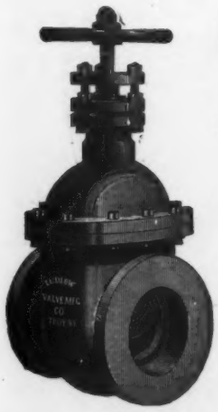

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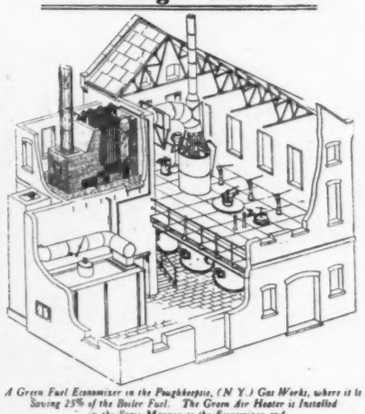

A Green Fuel Economizer in the Poughkeepsie, (N. Y.) Gas Works, where it is Saving 25% of the Boiler Fuel. The Green Air Heater is Installed in the Same Manner as the Economizer and will save 15% of the Generator Coal.

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The stack valve gases from a gas generator usually escape at from 1,500° to 1,800° F. After passing them through the Green Air Heater to heat the blast they will still have a temperature of 800° F., which is higher than the usual temperature of flue gases from boilers. They may, therefore, still be used to heat water for the boiler, and will thus save 20 per cent. of the boiler coal. On this basis, a plant making 5,000,000 cubic feet of gas per month will save nearly $2,500 per year on a total investment of $3,500.

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Stand so High in the estimation of those using them?

THE ANSWER IS IN THREE WORDS:

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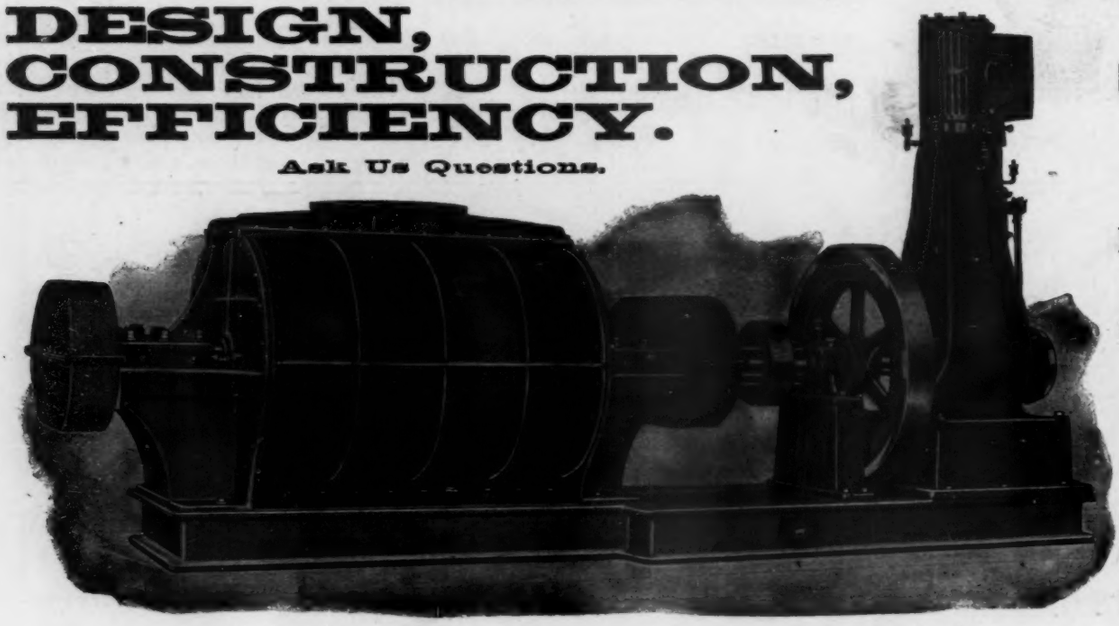

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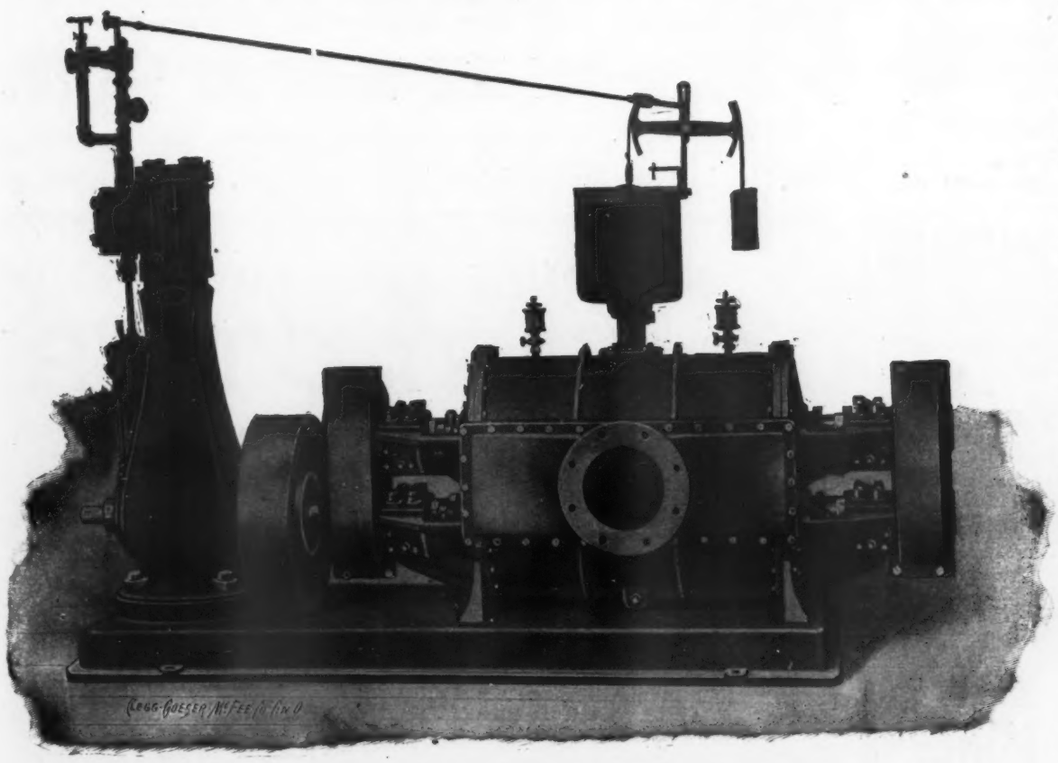

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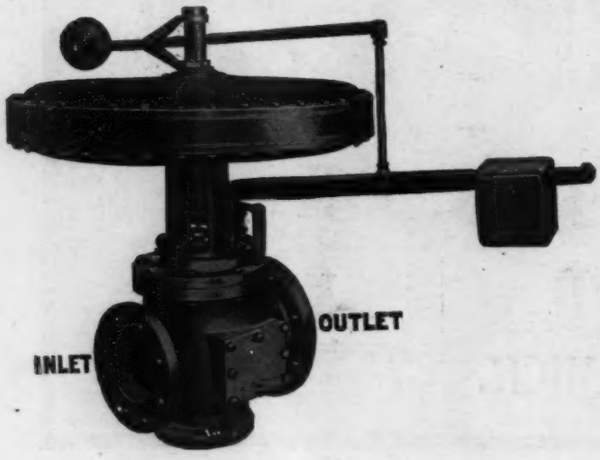

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Our DUPLEX SENSITIVE GOVERNOR, with Automatic Cutoff for district service, will reduce high pressure gas to inches of water without variation.

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Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

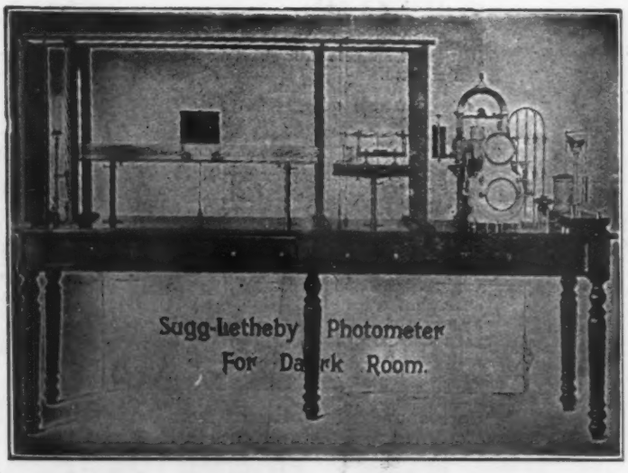
MAY, 1907.

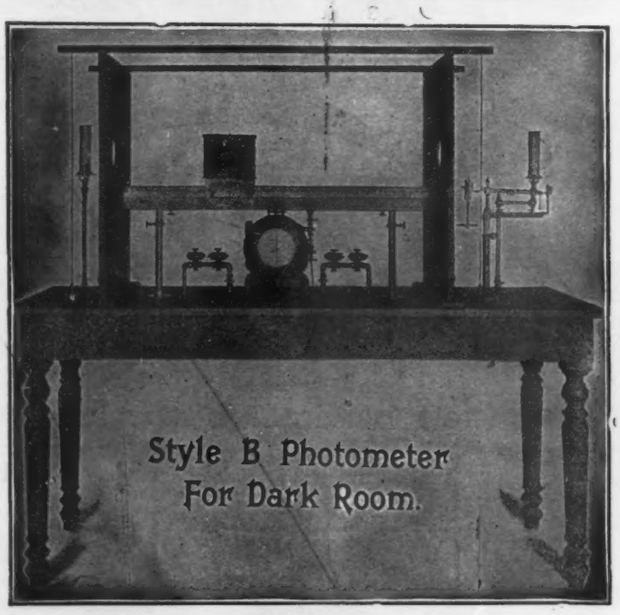
Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Wed.	1	7.20 PM	12.00 PM
Thu.	2	7.20	1.00 AM
Fri.	3	7.20	1.50
Sat.	4	7.20 LQ	2.40
Sun.	5	7.30	3.20
Mon.	6	7.30	3.50
Tue.	7	7.30	3.50
Wed.	8	7.30	3.50
Thu.	9	7.30	3.50
Fri	10	7.30	3.50
Sat.	11	7.30 NM	3.50
Sun	12	7.40	3.50
Mon.	13	7.40	3.50
Tue.	14	7.40	3.50
Wed.	15	7.40	3.50
Thu.	16	10.00	3.50
Fri.	17	10.40	3.50
Sat.	18	11.20	3.50
Sun.	19	12.00	3.40
Mon.	20	12.30 AM FQ	3.40
Tue.	21	1.00	3.40
Wed.	22	1.30	3.40
Thu.	23	2.00	3.40
Fri.	24	2.30	3.40
Sat.	25	3.10	3.40
Sun.	26	No L.	No L.
Mon.	27	No L FM	No L.
Tue.	28	No L.	No L.
Wed.	29	7.50 PM	10.50 PM
Thu.	30	7.50	11.50
Fri.	31	7.50	12.40 AM

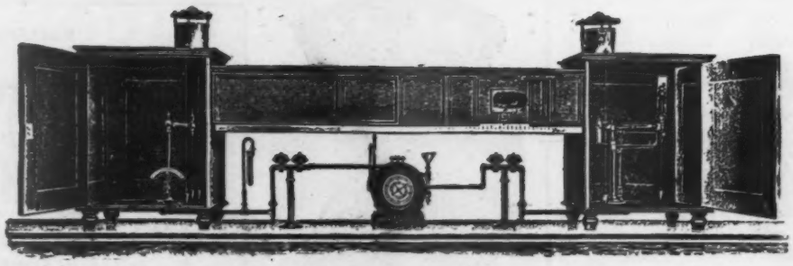
TOTAL HOURS DURING 1907.

By Table No. 1.

	Hrs.Min.
January	211.10
February	193.40
March	182.10
April	167.00
May	157.00
June	145.30
July	151.50
August	162.30
September	175.30
October	202.40
November	209.30
December	231.50
Total, yr.	2190.20







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

MAY, 1907.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. All Night Lighting. Light	Extinguish.
		P. M.	A.M.
Wed.	1	6.45	4.00
Thu.	2	6.45	4.00
Fri.	3	6.45	4.00
Sat.	4	6.45	4.00
Sun.	5	6.45	4.00
Mon.	6	6.45	4.00
Tue.	7	6.55	3.40
Wed.	8	6.55	3.40
Thu.	9	6.55	3.40
Fri.	10	6.55	3.40
Sat.	11	6.55	3.40
Sun.	12	6.55	3.40
Mon.	13	6.55	3.40
Tue.	14	7.00	3.30
Wed.	15	7.00	3.30
Thu.	16	7.00	3.30
Fri.	17	7.00	3.30
Sat.	18	7.00	3.30
Sun.	19	7.00	3.30
Mon.	20	7.00	3.30
Tue.	21	7.10	3.15
Wed.	22	7.10	3.15
Thu.	23	7.10	3.15
Fri.	24	7.10	3.15
Sat.	25	7.10	3.15
Sun.	26	7.10	3.15
Mon.	27	7.10	3.15
Tue.	28	7.15	3.15
Wed.	29	7.15	3.15
Thu.	30	7.15	3.15
Fri.	31	7.15	3.15

TOTAL HOURS DURING 1907.

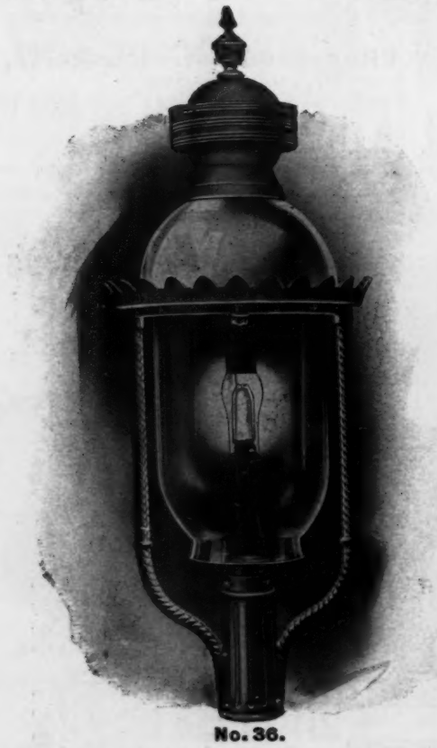
By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 318 West 42d Street. BOSTON, 820 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, 218 La Salle Street. SAN FRANCISCO, 512 Oak Street.

WELSBACH STREET LIGHTING COMPANY

....OF AMERICA....



No. 36.

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Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

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Perfect Combustion.
Lowest Gas Consumption.
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Will Fit Any Fixture.
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Council Bluffs, Ia. (2d contract).
Seattle, Wash. (2d contract).
Philadelphia, Pa.
Waterbury, Conn.
Manchester, N. H.
Allentown, Pa.
Omaha, Neb.
Muskegon, Mich.
Nazareth, Pa. (2d contract).
Lewistown, Pa.
Greenville, Tex.
New York, Cent. Un. (3d contract).
Jefferson City, Mo.
Peekskill, N. Y. (2d contract).
Waterville, Me.
Washington, D. C. (4th contract).
Lawrence, Mass. (3d contract).
Hampton, Va.
Aurora, Ills. (2d contract).
Milwaukee, Wis.
Syracuse, N. Y. (2d contract).
Davenport, Ia.
S. Brooklyn, N. Y. (3d contract).
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Leominster, Mass. (2d contract).
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TOTAL SETS INSTALLED IN 1906, ... 41
TOTAL SETS TO DATE, ... 634
TOTAL DAILY CAPACITY, ... 502,555,000 cu. ft.

Tar Extractors for Carburetted Water Gas.
Photometrical Apparatus.
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Recording Gauges.
Straight Standpipe System for Coal Gas Retorts.
Straight Standpipe Cleaners.

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GEROULD'S IMPROVED RETORT CEMENT.

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

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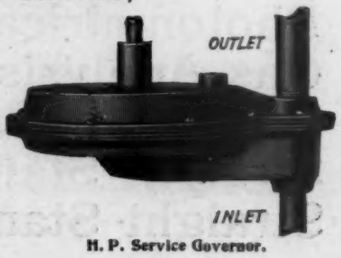

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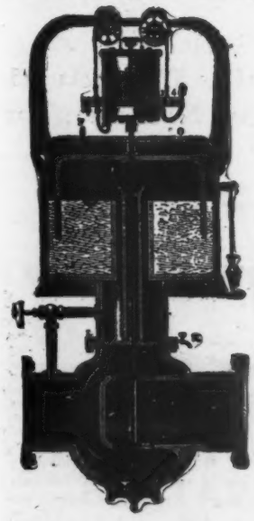

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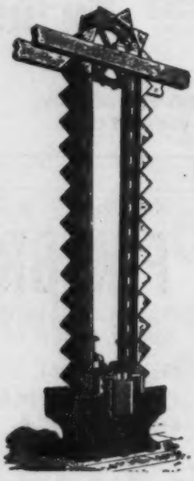

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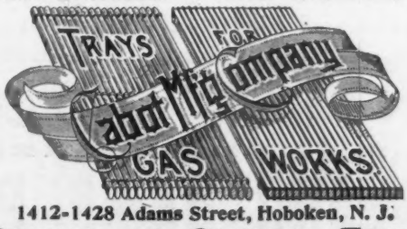

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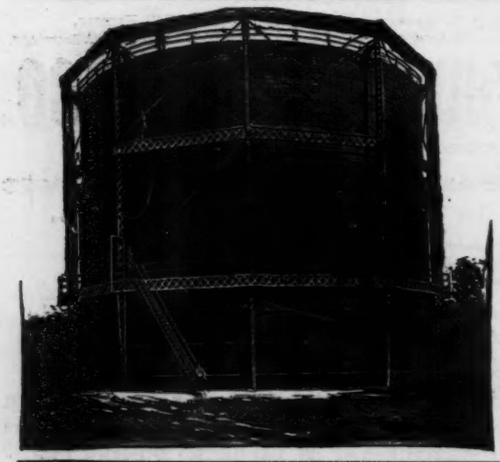

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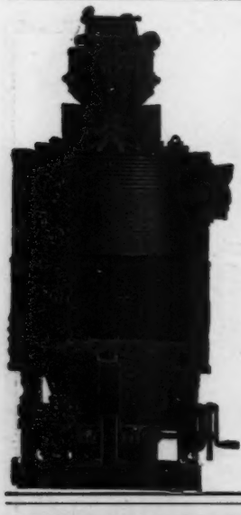

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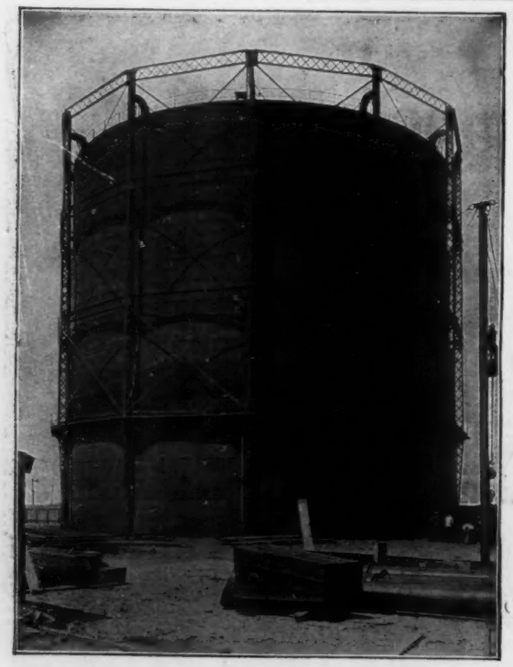

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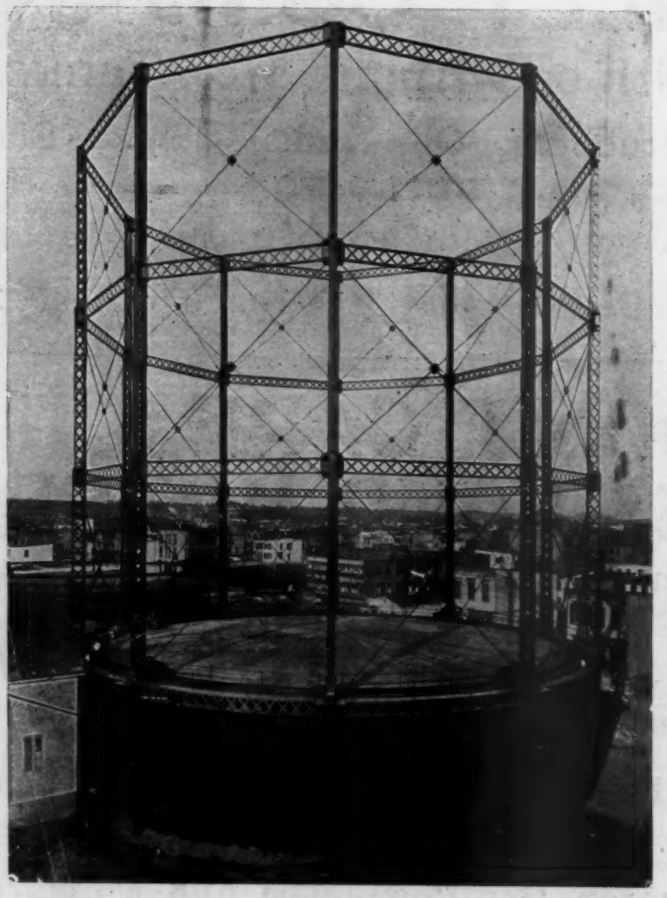

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